Better Homes and Gardens®

WOOD®

The Shop-Proven Woodworking Magazine

ISSUE 162 APRIL/MAY 2005

BONUS POSTER
Choose the right finish

9 small-shop projects

p. 35 and 90

plus ...

clutter busters

- garage/basement cabinets
- workshop overhaul
- outdoor storage bench

weekend projects

- dresser-top valet
- keepsake box
- chamfer plane

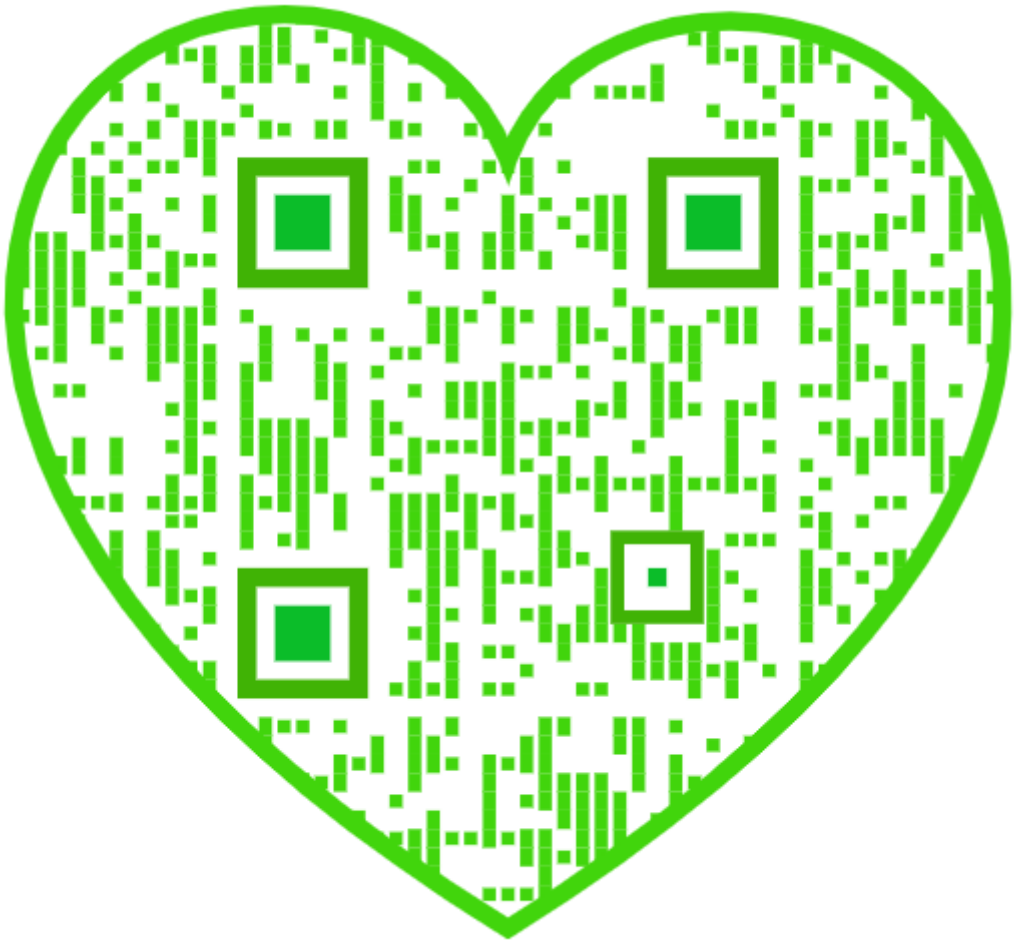
skill builders

- routing small parts
- super dowels for stronger joints
- how to texture wood

cool tools

- 12 brad nailers rated
- 5 problem-solving clamps

flatten any piece of wood – with no tearout!



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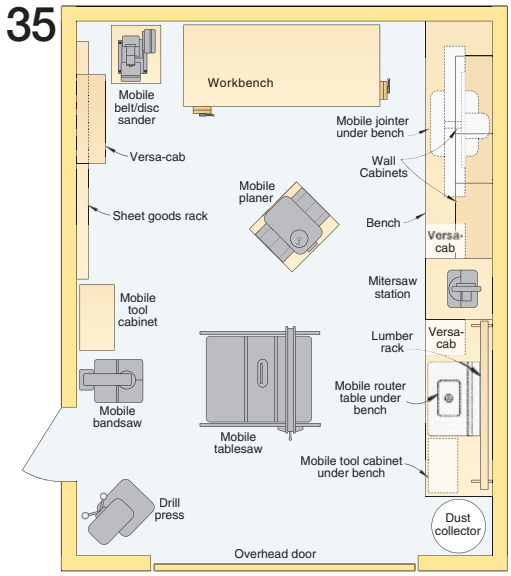
WOOD MAGAZINE SHOP TESTED APPROVED®

This seal is your assurance that we build every project, verify every fact, and test every reviewed tool in our workshop to guarantee your success and complete satisfaction.



editor's angle

shop safety: never take it for granted

All of us learn by our mistakes, however painful they can be. But you can get the gain *without* the pain when you take a cue from the mishaps of others. In that spirit I bring you this recent real-life story.

Even the best of us can have a shop accident when we're in a hurry—just ask Chuck Hedlund, our Master Craftsman.

I was in a meeting with Tool Editor Dave Campbell, discussing future articles, when I was told that Chuck Hedlund, our resident Master Craftsman, had injured himself in the *WOOD*® magazine shop. "What?" I thought to myself, "Chuck is one of the safest woodworkers I know; how could he have a shop accident?"

As I soon learned, Chuck had cut his thumb and damaged its nail on the drill press, despite his 35 years of professional woodworking experience. While setting the cutting depth of a 30mm multi-spur Forstner bit, Chuck lowered the spinning bit to a rabbeted edge, clasping the workpiece to the fence with one hand. The bit's rotational force pulled the workpiece and Chuck's thumb into the bit. As with most shop accidents, everything happened in a split second.

I later asked Chuck how he would do this operation differently in the future. "I should have taken the time to clamp the workpiece to the drill-press table," he said. "That's always a good idea when you're working with a large drill bit or circle cutter."

As Chuck points out, clamps have many uses in the shop beyond helping you assemble projects. Use them with your drill press or mitersaw, especially when you're machining small parts. When you can't clamp the workpiece, say when passing a board through a tablesaw or jointer, employ pushsticks and pushblocks.

Other favorite safety tips

Although not a complete list by any means, here are some of my favorite pointers for injury-free woodworking:

- **Never perform potentially dangerous operations when you're hurried, upset, or tired.** Machining stock with power tools requires your full concentration.
- **Listen to that little voice in your head.** If it says you're headed for trouble, pay attention—don't gamble that you *might* get away with a dangerous operation. Slow down, take a breath, and do things safely.
- **Respect your power tools.** You can become *too* comfortable with a machine; don't forget how quickly it can hurt you.
- **Tune your tools.** Misaligned fences and other out-of-whack components can contribute to stock binding and kickback.
- **Stay out of harm's way.** Know the path that a piece will take if it kicks back, and position yourself elsewhere.
- **Dress for success.** *Do* wear eye, ear, and lung protection. *Don't* wear loose-fitting clothes or jewelry that can get caught in machinery.
- **Never ball up oily rags.** Avoid fire by spreading oil-soaked rags on a noncombustible surface to dry.

Enjoy your woodworking and be safe,

Bill Krier

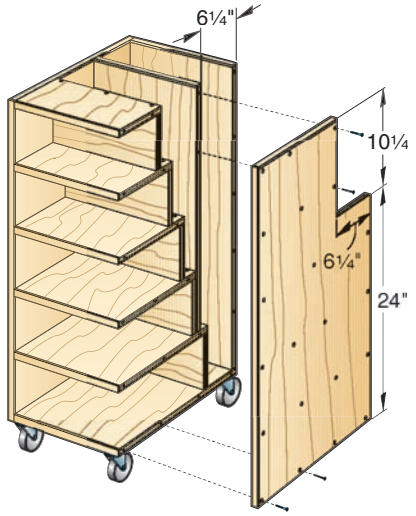
sounding board

Our bulletin board for letters, comments, and timely updates

Easy-access scrap sorter

I have a suggestion for your scrap sorter in issue 160, page 37. The ceiling in my shop is low and I find that when I have to place a longer piece in the rear-most compartment, I ding the ceiling. I remedied this by cutting one side where it covers the rear compartment down to 24", as shown *below*. This allows long pieces to be angled into the sorter easily without the dull thump that can only mean one thing.

Don Cherry, Leicester, Mass.



CMT touts safety for its blade and bit cleaner

Your article on blade and bit cleaners in issue 158, page 20, makes mention of safety precautions for the various products but includes no tests to distinguish environmentally clean and safe agents from those that are dangerous to the user and the environment.

Your readers should know that CMT Formula 2050 measures at pH 10.5 by litmus paper and pH 10.8 by meter, according to our tests. [A pH of 7 is neutral; pH numbers below 7 are increasingly more acidic, while pH numbers above 7 are increasingly more alkaline.] At that pH, Formula 2050 is a mild eye irritant; if it comes into eye contact, rinse with water for 15 minutes. No precaution exists for skin irritation, but we advise rinsing with water after use.

In our tests, the review winner, Empire Blade Saver, has pH 14 by litmus paper and pH 13.9 by meter. Any pH 14 material can cause eye burns as well as skin burns, ulcers, and rashes. If ingested, a pH 14 material may cause severe and permanent damage to the digestive tract. Inhalation may cause severe irritation, burns, and possible coma. Prolonged or repeated skin contact may cause dermatitis.

In a pH test conducted in the *WOOD* shop, we confirmed CMTs results: CMT Formula 2050 measured 10.5; Empire Blade Saver, 14.

Formula 2050 is a fast-acting pitch-and-grime remover, as proven by your tests, but much safer than other products that clean as well.

James LaMuraglia, CMT USA

Editor responds

I agree that CMT is a highly effective and safe product. Empire Blade Saver received the "Top Cleaner" designation because it costs less to use and removed slightly more pitch and grime on uncoated blades after 5- and 30-minute soaking intervals. The products were equally effective at removing debris from non-stick coated blades. That said, woodworkers must be more cautious using the Empire product, protecting their eyes and skin, as recommended in the article. I'm glad Mr. LaMuraglia raised this issue so that readers can best judge what's most important to them.

Dave Campbell, WOOD® *Magazine Tool Editor*

Article updates

In issue 159, page 89, change the MLCS Ltd. cast-iron router table model number to #9593.

In issue 160, page 18, the Penn State four-jaw chuck model C3418 has been discontinued, replaced by model CUG3418, shown at *right*.

HOW TO REACH US

- **Woodworking advice:**
  Post your woodworking questions (joinery, finishing, tools, turning, general woodworking, etc.) on one of 20+ online forums at **woodmagazine.com/forums**

- **Editorial feedback:**
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- **Updates to previously published projects:**
  For an up-to-date listing of changes in dimensions and buying-guide sources from issue 1 through today, go to **woodmagazine.com/editorial**.

Better Homes and Gardens®
WOOD®

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Bill made this dresser-top valet out of walnut. See *page 42* for plans.

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Marlen and his kids made 29 birdhouses for relatives, friends, and teachers at Christmas.

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askwood

Answers to your questions from letters, e-mails, and WOOD Online®

Spinner speeds vise adjustment

Q: The end vise on my workbench takes an annoyingly long time to adjust. How can I get a speed boost without plunking down a huge amount of money for a nut-release model?

—William Bradley, Memphis

A: A steering wheel spinner attached to the bar of the vise will put your adjustment speed into high gear, William. This inexpensive accessory also eliminates bashed or pinched fingers. Spinners are no longer a common item at auto parts stores, so you'll have better success at shops that sell riding mowers. We purchased ours from Northern Tool and Equipment (800/221-0516 or northerntool.com). Ask for item #16931. The one shown costs $12.99 plus shipping.

Twirling a steering wheel spinner opens and closes your bench vise quickly when it doesn't have a quick-release mechanism.

The nuts and bolts of threading wood

Q: I'd like to incorporate threaded wood bolts and nuts into an upcoming project. Is this a difficult process to set up and learn?

—John Schroeder, Evansville, Ind.

A: To answer your question, John, we tried out two threading systems and got good results with both. The first is a hand-powered threadbox with a V-shape cutter that slices the threads into a dowel. We found a ¾" die (item #G1868) for $16.50 from Grizzly Industrial, 800/523-4777 or grizzly.com. A tap for making ¾" threaded holes is $8.50 (item #G1869). To use the threadbox, apply slight downward pressure for the first few turns. After that, the wood thread engages the nut inside the threadbox and begins feeding itself. If you just want to try threaded dowels, the manual threadbox will get you started and make clean cuts in straight-grained woods.

The Beall Wood Threader uses a router to drive a carbide bit supplied with the threader kit. This jig must be set up precisely to work properly. Before you cut the threads, follow the directions to tap a sample hex-nut. This serves as a guide for setting the router's depth of cut. Don't aim for too tight a fit because any change in the moisture content of the wood might hamper assembly.

Prices range from $74 for a ½" threader to $179 for a set to do four sizes (Beall Tool Co., 800/331-4718 or bealltool.com). The The Beall tool also lets you make smooth cuts even in difficult materials. We found the Beall tap easy to start squarely because an unthreaded pilot engages the hole before the bit begins cutting. You can remove the pilot to convert the tool into a bottoming tap that cuts threads nearly to the bottom of a hole.

You can cut threads manually with a traditional threadbox shown above or add a Beall jig to your router for a power assist, as shown at right.

Continued on page 14

Air-powered showdown: Brad nailer vs. finish nailer

Q: Though I'm relatively new to woodworking, I plan to build several pieces of furniture and some cabinets. As I add tools, I'm wondering when to use a brad nailer, and when is it better to nail with a finish nailer?

—F. Gregory Bartlett, Freeport, Bahama Islands

A: For your purposes, Greg, a brad nailer is the better choice unless you also do a fair amount of construction or trim carpentry. A typical brad nailer shoots 18-gauge fasteners 5/8–2" long and is handy for tacking glued molding in place on projects or assembling jigs. These thin brads with narrow heads leave only a tiny hole to be filled on visible surfaces. A finish nailer drives heavier and longer 15- or 16-gauge fasteners in the 1¼–2½" range. That extra heft serves you well when you install crown molding or assemble heavy cabinets without glue, but these fasteners leave a bigger hole in the surface. Other points to consider: brad nailers weigh significantly less than finish nailers and cost less, too.

A lightweight brad nailer offers a convenient way to hold furniture joints while glue dries, as in the drawer construction shown here.

The truth about recharging cordless-tool batteries

Q: I keep my spare cordless tool batteries in their chargers, and I've heard that this practice can damage the batteries. Should I remove them from the chargers as soon as they're recharged?

—Tom Morgan, Cannon Falls, Minn.

A: Go ahead and leave them in their chargers, Tom. Good-quality chargers are designed to keep batteries at a full electrical charge without overheating them. If you charge a battery and then remove it from the charger, it loses up to 20 percent of its charge the first day, another 10 percent the second day, and about 1 percent every day after that.

Follow these recharging guidelines:

■ Recharge a battery as soon as you notice a drop in power. Draining the charge completely can damage the battery.

■ A battery that's over 105 degrees F or under 40 degrees F won't take a full charge, so try to do your recharging at room temperature.

Go ahead and leave the extra battery from your cordless tool in its charger. It will be ready to go when you need it.

First choices for secondary woods

Q: What single species is the best secondary wood for building drawer sides and cabinet parts that get hidden in a project?

—Otto Beers, Parkville, Mo.

A: Don't feel limited to just one choice, Otto. You just need any strong, easy-to-work wood species that meets your price needs. Lumber suppliers can recommend locally price-competitive species—which describes red oak in our area. Pine works for lightweight to medium-duty drawers. For additional strength and a firmer anchorage for hardware screws, consider an inexpensive hardwood. We have a few favorites around the shop: soft maple, basswood, aspen, birch, and poplar among them. The high strength, consistency, and stability of easily worked Baltic birch plywood gives you still another option.

Among solid secondary woods, pine is fine and poplar is popular. Baltic birch plywood minimizes waste and eliminates thicknessing from your milling steps.

Got a question?

If you're looking for an answer to a woodworking question, write to **Ask WOOD, 1716 Locust St., GA-310, Des Moines, IA 50309-3023** or send us an e-mail at **askwood@mdp.com**. For immediate feedback from your fellow woodworkers, post your question on one of our woodworking forums at **www.woodmagazine.com**.

adjustable miter-gauge extension

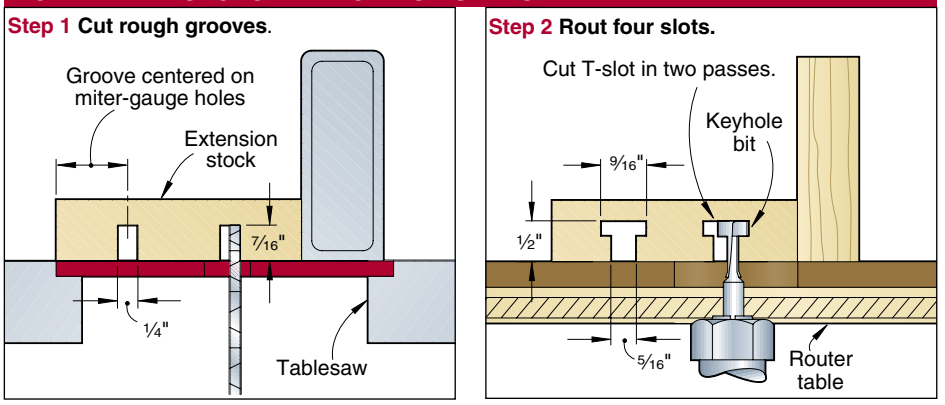
With shop scraps, a router bit, and a pair of bolts, you'll have this shop helper up and running in minutes.

If you're like the craftsmen in the *WOOD*® magazine shop, you usually have a wooden extension attached to your tablesaw miter gauge. An extension gives you control when crosscutting and backs up cuts to prevent grain tearout. Sometimes you'll clamp a stopblock to it for accurate repeat cuts or to control the length of a tenon or lap joint. While most scrap extensions are screwed to the miter gauge and fixed, here's how to make an infinitely adjustable one with router-cut T-slots and a pair of ¼" toilet-flange bolts. (You'll find these bolts in the plumbing department of hardware stores or home centers.) The extension is so easy to make, you won't hesitate to throw it away when it's used up.

The position of the attachment holes in your miter gauge determines the width of the extension. For a miter gauge with holes close to the bottom, a 3"-wide extension will accommodate two T-slots. (The Delta shown in the photos has holes ⅞" from the bottom.) For a miter gauge with holes higher up, measure from the bottom of the gauge to the center of the holes, and double this dimension to determine the width of an extension with a single, centered T-slot. A range of 18–24" is a good length. Use solid stock, plywood, or medium-density fiberboard for an extension, and make several at a time so you'll always have a fresh supply.

With your extension stock cut to size, use your tablesaw to cut grooves, where shown in **Step 1** of the drawing, *above right*. Then switch to your table-mounted router, and use a keyhole bit to rout T-slots, where shown in **Step 2**.

FORM THE T-SLOTS IN TWO EASY STEPS



Enlarge the holes in your miter gauge to 17/64", and fasten the extension to the miter gauge, as shown *below*. When one end of the extension gets chewed up, loosen the bolts, and slide it off. Flip the extension end for end, slide it back over the bolts, and tighten the nuts, bringing the uncut end of the extension into play, as shown *below*.

EASY-TO-FIND T-SLOT BOLTS

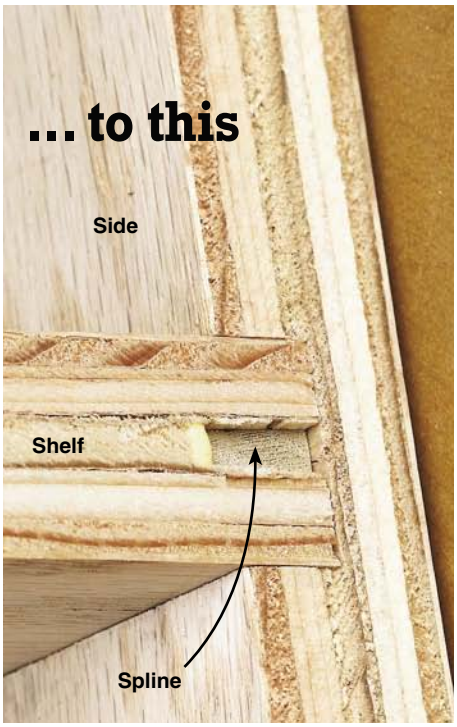
The elongated flat head of a toilet-flange bolt makes a perfect T-slot fastener. If space allows, substitute wing nuts in place of the supplied hexnuts.

TWO ENDS DOUBLE THE LIFE

Whether your extension has twin T-slots or a centered one, you can mount it with either edge down. When one end is used up, flip the extension end for end.

a fitting end for too-wide dadoes

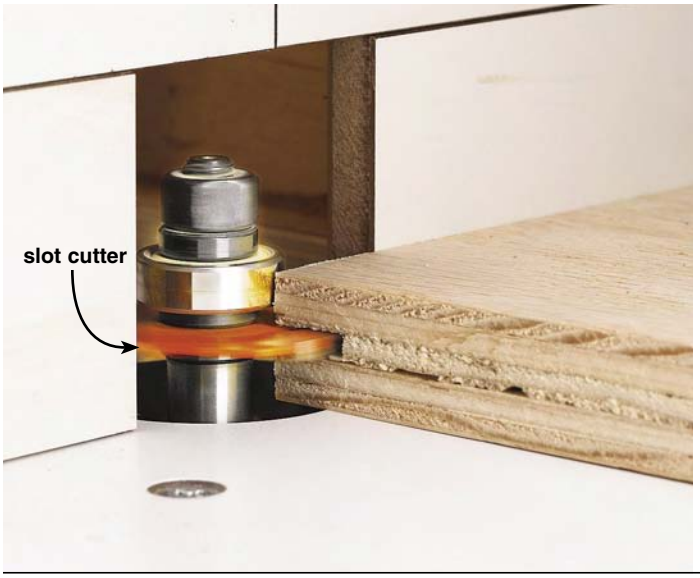
Let a simple spline restore the snug fit your joint deserves.



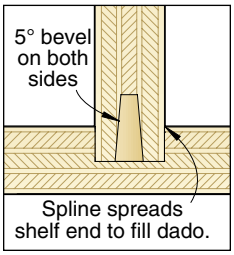
Sometimes, even with your best efforts at accuracy, creating snug-fitting joinery can be difficult. Take a dadoed shelf joint for example: You painstakingly measure the thickness of the plywood shelf, carefully adjust your dado blades to that thickness, and voila! the dado you cut is too wide, and the shelf fits loosely, revealing a gap. Another piece for the scrap bin? Not so fast—here's a nifty solution aimed at fixing your ill-fitting joint.

In this case, you can't fix the part with the dado, but you can use a little trick to "thicken" its shelf counterpart. Simply insert a small spline in the shelf end, which acts as a wedge to gently widen the end to better fill the oversize dado, as shown *above right*. Here's how to go about it.

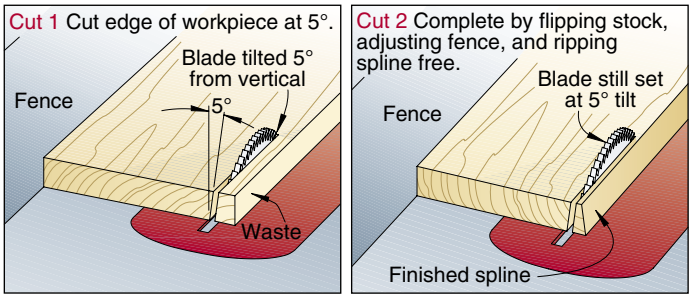
1 Start by routing a ⅛"-wide × ½"-deep slot down the center of the shelf end. For best results, we used a slot-cutter bit. Measure the exact width of the slot.



2 Make the spline from a ½"-thick piece of solid wood. Ideally, the thicker end of the spline should be about 1/16" thicker than the slot itself. Tilt your sawblade 5°. Now rip the edge to form the first bevel, *below, left*. Next, flip your stock end-for-end, reset your fence to achieve the desired thickness, and make the second pass, ripping the spline free. Dry-fit the spline in the shelf groove. (To remove it, tap the spline out one end of the slot.) If it makes the shelf end too thick, just sand the spline a little.



HOW TO CUT SPLINE STRIPS


Cut 1 Cut edge of workpiece at 5°.
Blade tilted 5° from vertical
Fence
5°
Waste
Cut 2 Complete by flipping stock, adjusting fence, and ripping spline free.
Blade still set at 5° tilt
Fence
Finished spline

3 Once you're satisfied with the fit and feel it thickens the shelf end enough, apply glue to the slot. Tap the beveled spline into place, seating it fully. Then cut off and sand any protruding spline at each end.

Written by **Susan Jessen**

easy-adjust picture frame jig

Ensure tight mitered corners while keeping frames flat.

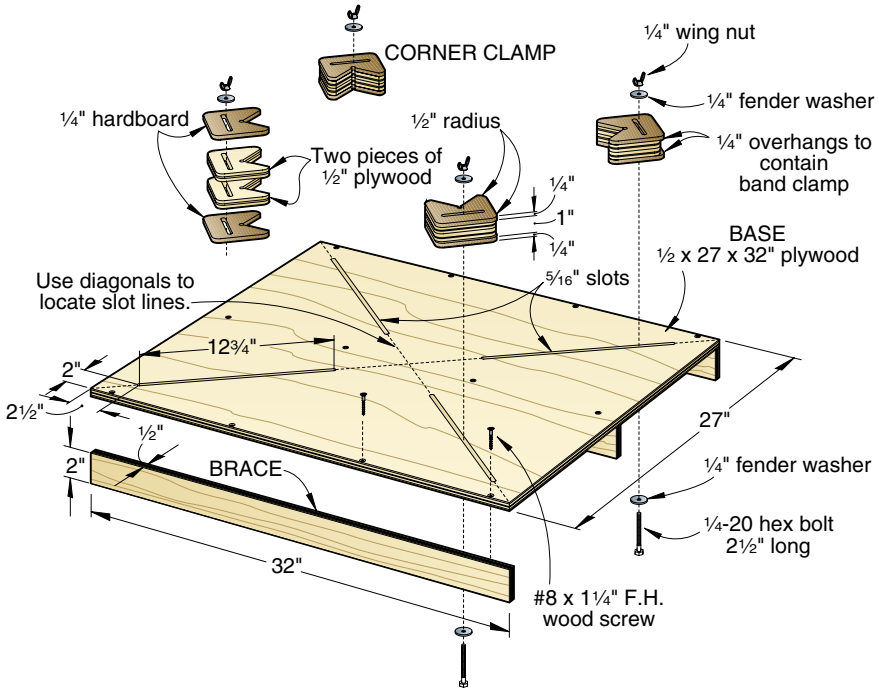
If you've ever assembled a picture frame, you know the difficulties of creating seamless miters and a flat glue-up. Sometimes numerous clamps and an extra set of hands don't seem to be enough. *WOOD*® magazine reader Dennis Parrot of Greenfield, Massachusetts, solved that problem with this adjustable frame jig.

Cut the base, braces, and corner clamps, as dimensioned *below*. Our jig measures 27×32", but you can increase your dimensions for larger frames. The three braces across the bottom keep the base flat when applying clamping pressure later.

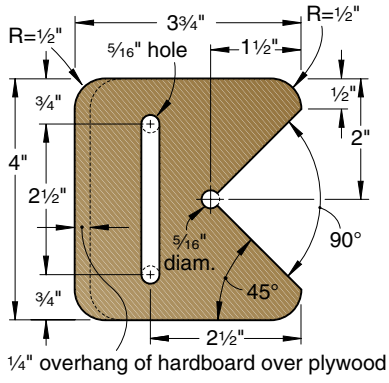
Glue and clamp the corner clamp parts together. The overhanging hardboard captures the clamp banding when using the jig later. After marking diagonals on the base to locate the slot centerlines, we drilled a 5/16" hole at the end of each slot, connected the outer edges of the holes with straight lines, and cut the slots to shape with a jigsaw. Sand all the parts smooth and apply a clear finish. Later, secure a corner clamp to each slot with bolts, washers, and wing nuts, allowing just enough slack so the clamps can slide on the base.

To use the jig, place a corner clamp at each corner of the frame being clamped. Waxed paper beneath the frame corners prevents the glued joints from adhering to the base. Wrap a 1"-wide band clamp around the corner clamps and tighten, as shown in the photo *above*.

PICTURE FRAME JIG



CORNER CLAMP



Find more great jigs at **woodmagazine.com/jigs**

our editors test

shop radio battery chargers

Why buy?

Music soothes the savage beast, and it makes the shop a much more pleasant place to work. But ordinary home stereos and boom boxes aren't designed to withstand the dusty abuse that a woodworking shop or job site can dish out. The portable stereos we tested are designed specifically to survive those rough environs. Both have AM/FM digital tuners and built-in clocks and, when plugged into an AC outlet, will charge cordless-tool battery packs of the same brand while they crank out the music. When you take the radio on the road and away from a plug-in power source, that same battery pack powers the unit for hours on end.

DeWalt DC011, $130

Editor test-drive:

I used the DC011 in my shop, in the house, and outdoors during a brief rainfall, and its sound quality is comparable to the Bosch unit, *below.* In perhaps its most grueling test, however, I allowed my teenage daughter to take it to her volleyball practice. There it filled a gym with loud but distortion-free music, and its roll cage and wide footprint helped it survive several direct volleyball hits.

A telescoping antenna would never survive that abuse, but this unit's short (11") flexible antenna takes a lickin' without snapping off. I would never submerse it in water, of course, but the DC011's sealed, weatherproof construction makes it resistant to liquid spills or raindrops.

The DC011's built-in one-hour diagnostic charger refuels—and runs on—DeWalt battery packs from 7.2 to 18 volts. Using my 14.4-volt NiCd packs, the radio (with presets for eight stations) played all day on a fully charged pack. You can plug in a CD or MP3 player through the auxiliary port. It also comes with a detachable storage case for holding a slim CD player and discs.

—Tested by Bill Krier, Editor-in-Chief

To learn more:

800/443-9258; dewalt.com

Bosch PB10-CD, $180

Editor test-drive:

With a compact-disc player that reads both ordinary CDs and MP3 discs, and an AM/FM tuner (10 AM and 20 FM presets), Bosch's cube-shape Power Box PB10-CD has more features than many bookshelf stereo systems. The dust- and moisture-resistant speakers deliver clean, bright sound, with decent—but not thunderous—bass.

The PB10-CD charges Bosch batteries from 12 to 24 volts in about an hour. I powered the CD player with 12- and 14.4-volt packs and each worked from dawn to dusk—longer than I can go before recharging *my* batteries. Four GFCI-protected outlets turn the boom box into a power strip, and a 12V DC port allows you to plug in a cell-phone charger.

Surrounded by a protective roll cage, the manufacturer says the PB10-CD will withstand a 10' drop. I couldn't bring myself to do that, but I did send it tumbling like a die across the backyard, and it not only survived, but the CD didn't even skip. Don't need the disc player? Bosch's PB10 is the same unit, sans CD, and sells for $150.

—Tested by Dave Campbell, Tools Editor

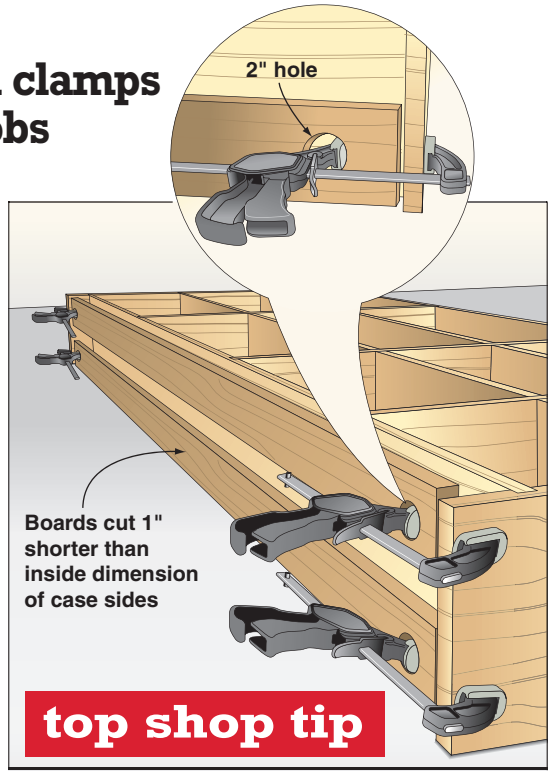
To learn more:

877/267-2499; boschtools.com

shop tips

Helping you work faster, smarter, and safer

Stretcher lets small clamps tackle big-clamp jobs



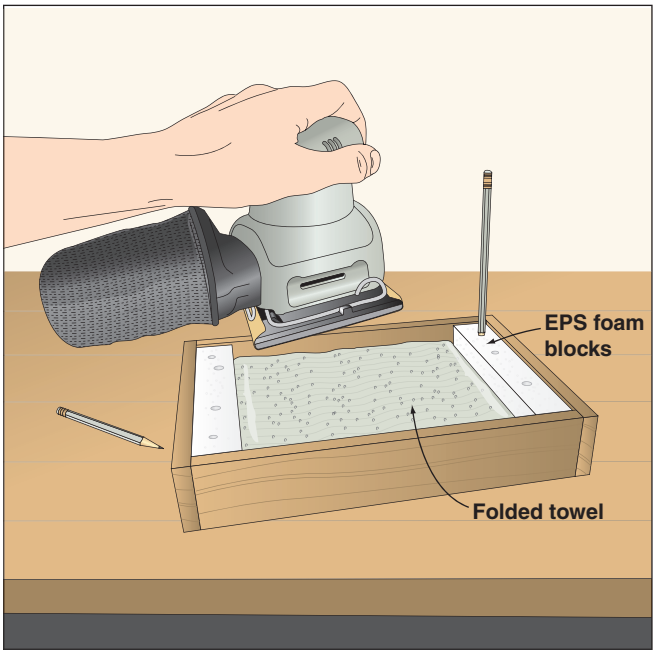
While building a bookcase for my sister-in-law I needed to find a way to clamp the sides to the 90" main shelves. Because I wanted to avoid nail holes and didn't have any 8' pipe clamps, I hit on the idea of using holes in a board to hold small bar clamps like those shown in the illustration.

To make the clamp jig, I cut a board 1" shorter than the inside dimension of the bookcase. Next, I drilled a 2" hole in each end of the board to accept one jaw of the bar clamp. I had to make several trips back and forth as I slowly increased the tension on each clamp, but the results meant I didn't have to buy and store overly large pipe clamps.

—Shirley Sanford, Amherst, Nova Scotia

Padded pit stop corrals bucking sander

In the past, whenever I turned off my finishing sander, it seemed I had to wait forever for it to stop vibrating before laying it on the bench. So, I provided a perch for my sander using an 8×12" scrap of plywood as a base and some scrap wood for the sides. I lined the box with a folded towel to absorb the vibration, and then wedged two pieces of rigid EPS (extruded polystyrene) foam insulation in the box along two edges to secure the towel.



Now I can immediately lay the sander down when finished, and it won't try to vibrate off the workbench. The towel even deadens the sound. As an added bonus, I find the sander box useful for holding small parts when disassembling something, and I use the foam as a handy pencil holder.

—Chuck Burlingame, Clayton, N.Y.

Continued on page 26

Our Winner

Preston Photography

Shirley Sanford has spent much of his life dealing with an unusual first name, especially in his job as a heavy-equipment mechanic. "The only time I got a break," our Top Shop Tip winner explains, "was several years ago on a job site where I borrowed a hard hat with the name 'Sam' on the front. To this day, there are people there who call me Sam." Since retiring a few years ago, *Mr.* Sanford spends most days in his woodworking shop building furniture for his family and friends.

Shirley Sanford really cleaned up with his Top Shop Tip, because we're rewarding him with a General International wet/dry vacuum (model 10-300), worth $250!

Top tips win tools!

Describe how you've solved a workshop dilemma, and you'll earn $75 if it appears here. And, if your tip garners Top Shop Tip honors, you'll also win a tool prize worth at least $250.

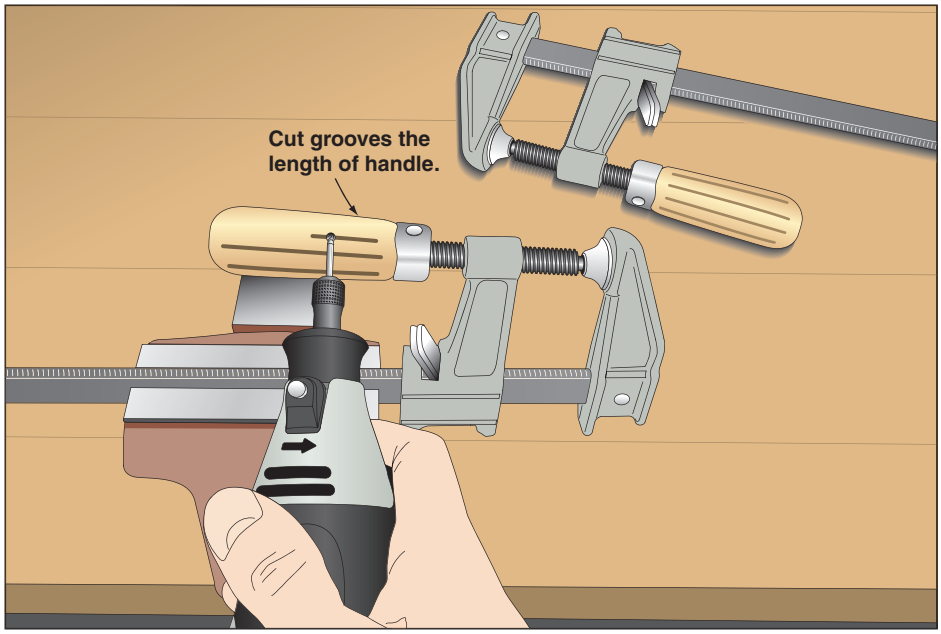
Send your best tips, along with photos or illustrations and your daytime phone number, to: **Shop Tips, WOOD Magazine, 1716 Locust St., GA-310, Des Moines, IA 50309-3023**. Or e-mail tips to: **shoptips@woodmagazine.com**. Remember to include your contact info in the e-mail as well.

Because we try to publish only original tips, please send your tips only to *WOOD* magazine. Sorry, submitted materials can't be returned.

Groovy clamp handles won't slip from your grip

The smooth, varnished wooden handles on bar clamps look slick. But they're too slick to grab tightly when you screw down to create serious clamping pressure. To get a better grip, I carve grooves along the length of the handles with a motorized rotary tool and a ball cutter. A few grooves spaced around a handle makes clamping (and unclamping) lots easier.

—Ian Ross, Smiths Falls, Ont.



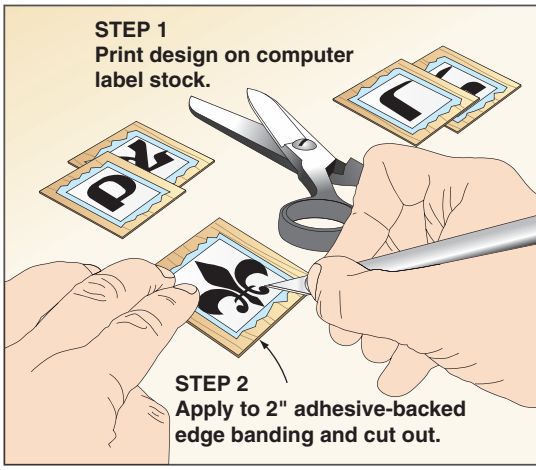
High-tech help gives you letter-perfect results

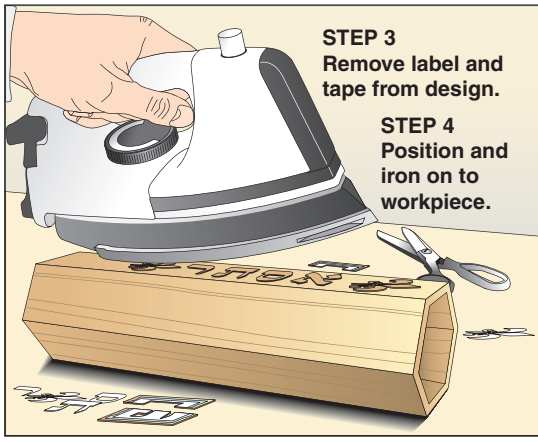
I wanted to apply Hebrew lettering, in a contrasting wood, to a project. I tried cutting letters out of thin veneer, but the wood split on the short grain. Then I noticed that my hardwood store carried 2"-wide iron-on edge banding in several species, and I was inspired.

First, I used my computer to print the lettering at the correct size on adhesive-backed shipping labels. Next, starting with an oversized square of edge banding, I covered its face with blue painter's tape (for easier release) and applied the lettered label over the tape. Finally, I cut out the letters with a sharp pair of scissors, using a sharp crafts knife for tight inside cuts.

The edge banding's thick glue backing held the letter together while I cut out the shape and removed the label and tape. Even the delicate details of the *fleur de lis* accent held together perfectly. Once the letters were ready, I simply ironed them onto my project.

—Rabbi Don Pacht, Rochester, N.Y.



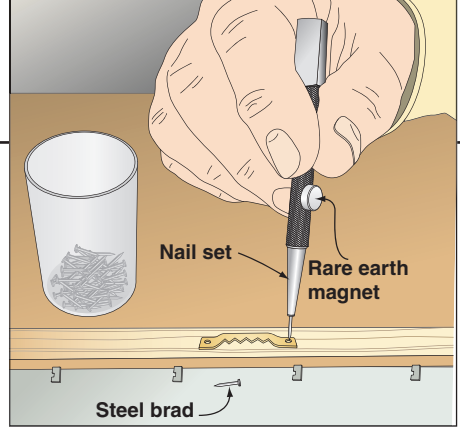


Continued on page 28

Surgical precision for extra small brad placement

You know how difficult it is to hold and hammer home tiny brad nails, especially if you have big hands and fingers. The usual result: bent and flying nails, and even larger fingers after you've whacked them with the hammer a few times.

To corral those little rascals and set them with the precision of a neurosurgeon, attach a powerful rare-earth magnet to the side of a nail set. (A ten-magnet package sells for about $5 from Rockler; 800/279-4441 or rockler.com.)



The nail set tip should be large enough to comfortably hold the nail head. The magnet will hold and align the nail until you set it and can safely finish the job with a hammer.

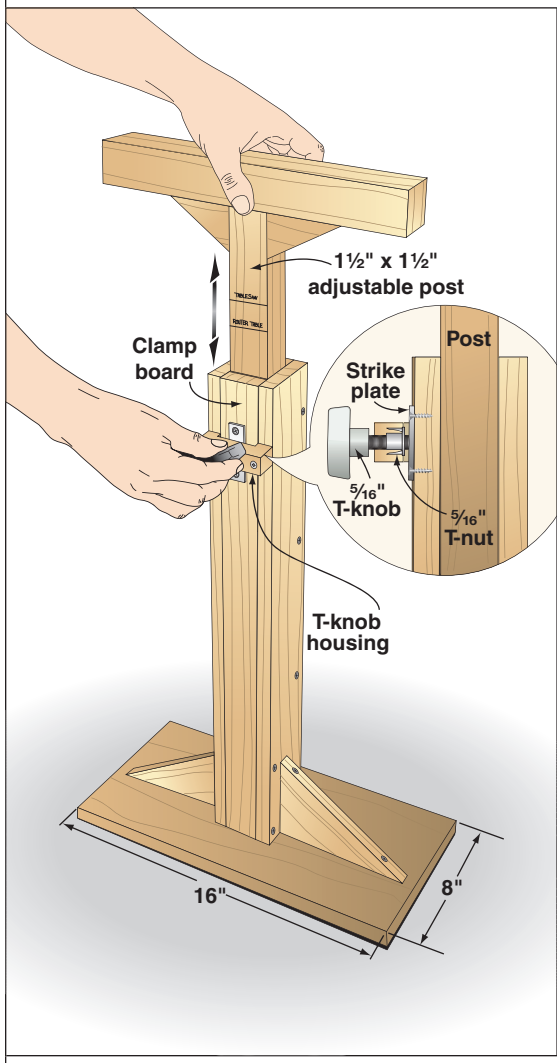
—Erv Roberts, Des Moines, Iowa

Telescoping work support rises to the occasion

As a frugal woodworker looking for ways to put pieces of scrap material to work, I designed this adjustable work support to provide a helping hand when working with long material at my miter-saw or drill press. The movable part of the stand is held in place through applied friction, and it's simple to adjust up and down according to your needs.

The T-knob, T-nut, and strike plate are held in the scrapwood T-knob housing, shown *below*, and provide the pressure on the clamp board. The housing also holds the sides of the base rigid while allowing the clamp board to lie loose along its upper half. To make fast adjustments, mark the heights for different tools or applications on the adjustable post.

—John Lanigan, Concord, N.H.



Continued on page 30

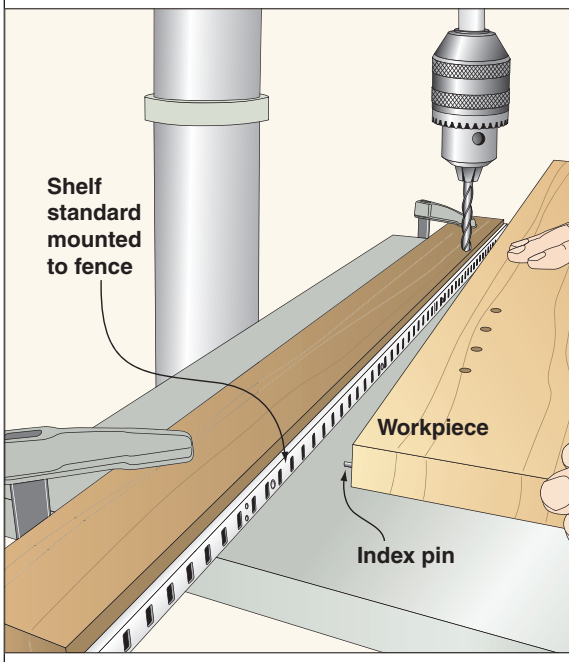
Shelf standard makes superior step-and-repeat jig

For attractive adjustable shelving, I prefer to drill individual holes for shelf pins rather than attach unsightly standards that were once so common. However, I kept one standard around to serve as a spacing guide for drilling the shelf pin holes. Here's how it works.

Mount the shelf standard to the edge of a straight board that acts as a drill press fence, and clamp the fence to the table at the desired spacing from the bit. Next, make an index pin by driving an 8d finish nail into the edge of your workpiece. Cut off the nail, leaving about ⅛" of the shank protruding.

This index pin now fits into the slots on the shelf standard. If you want shelf pin holes every inch, put the workpiece against the fence with the index pin in one of the standard's slots. Drill the first hole, move the index pin down two slots, drill the next hole, and repeat. With this special-use fence, I no longer have to measure every hole and I can rapidly and accurately drill hundreds of holes for adjustable shelves.

—Marshall Pearlman, Laguna Hills, Calif.



See a new Shop Tip of the Day at woodmagazine.com/tips

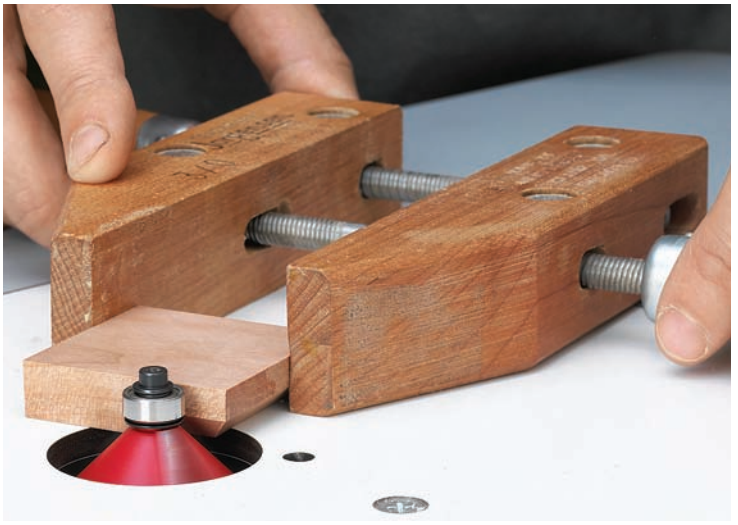
small-part safety

When routing small parts, it pays to employ the tricks shown in the photos at *right* to keep yourself safe while making quality cuts. For more guidelines, check out the "Rules of Thumb" *below*—so you can keep yours.

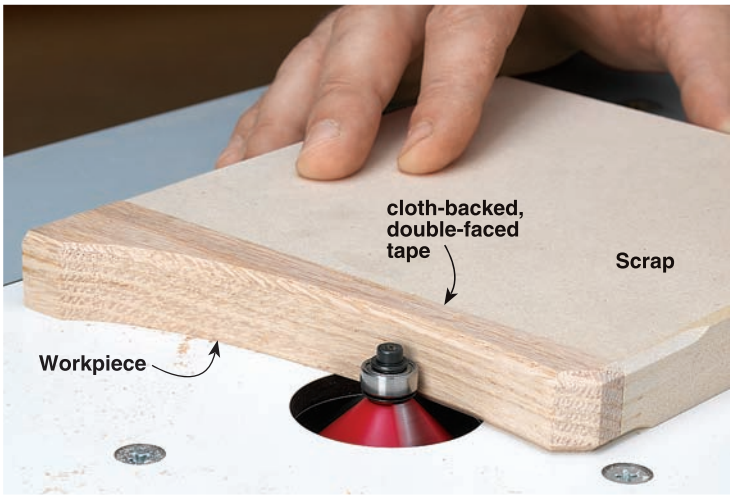
Routing Rules of Thumb

1. Always wear eye and ear protection while routing. Always.
2. Keep all bits clean and in good working condition—poorly maintained bits are accidents waiting to happen.
3. Ensure the workpiece is solid and free of splits or knots in areas that will be routed.
4. Plan so that your direction of feed moves against the rotation of the bit—this ensures the bit's thrust will pull the part against the fence, not push it away and send it flying. As a reminder, mark a curved arrow on your table showing the bit's rotation.
5. If possible, avoid using large bits when routing small workpieces—their size and force could destroy the parts.
6. Check to ensure you're using the right speed for each bit—for a bit with a diameter of 1" or less, keep the speed below 24,000 rpm. For 1–2" bits, keep the speed under 18,000 rpm.
7. Make your cuts in small increments (called "skinning") to help maintain control of the part. Try ⅛" as a rule.
8. Use a zero-clearance router base plate or table insert to prevent the small piece from tipping into the hole surrounding the bit.
9. Finally, rely on common sense. If it feels wrong in your gut, don't make the cut.

Written by **Susan Jessen**



A wooden handscrew clamp serves as a safe "extension" of your hands, gripping the small part firmly while sitting flat on the table surface as you rout its edges.



Scrap stock also helps provide you safety and control. Simply apply a strip of double-faced tape to one edge of the scrap, attach the workpiece, and rout. The scrap also assists in preventing chip-out.

For handheld routing of small parts, clamp a scrap to your workbench, and apply cloth-backed, double-faced tape to the top. Press the small part onto the tape for a secure hold during machining.

addressing the mess in Seattle

WORKSHOP WORKOVER 2

AFTER

From shambles to shipshape—we took two days, a modest budget, and a boatload of great ideas to restore order to a reader's shop. Use these same ideas to do a little shop remodeling of your own, and create a space where you truly can have a place for everything with ample room to move around.

In this second installment of "Workskop Workover," we've made it our mission to prove that your dream workshop may be closer, and more affordable, than you think. To make our case, we visited the shop of *WOOD*® magazine reader and Seattle woodworker Mark Lea. When we arrived, his one-car-garage shop looked more like a storage locker (see the photo at *right*), than a functioning workshop. But after a single weekend, and for less than $1,000, we transformed Mark's shop into a model of efficiency that even he barely recognized. To accomplish this feat, we used five basic organizational principles (see *page 37*) to put things in order. Now, equipped with the ideas found here, you can do the same.

First, an overview of what we did

To best show you the improvements to Mark's shop, here's a diagram of the floor plan and photos that say it all. Use the project drawings shown throughout to build the key components.

PROJECT 1: VERSA-CAB SYSTEM

This customizable cabinet system, dubbed the "Versa-cab" (see *page 38* for the plan), works as a wall or base cabinet. The cabinet's 15¾" deep top serves as a shelf for tool cases.

PROJECT 2: MITERSAW WORK STATION

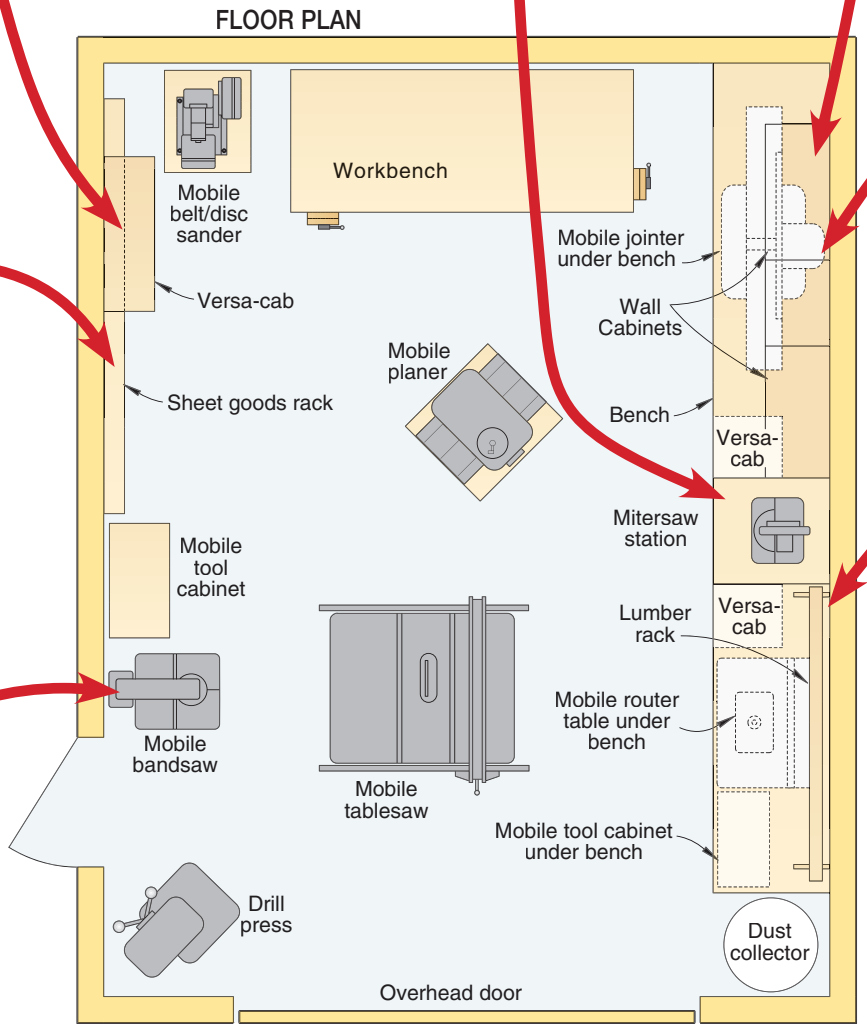
More than 32 square feet of countertop, not including the mitersaw platform, were added to Mark's shop. As you can see from the photos, none of the space, either above or below the countertop, is wasted. Most mitersaws benefit when they have a permanent home with plenty of work support on either side. Our mitersaw platform, supported by neighboring Versa-cab base cabinets, is deceptively simple to build and effective in function. (See *page 39* for the plan.)

PROJECT 3: SHEET GOODS RACK

A long but shallow rack allows Mark to store full-sized and partial sheet goods in spite of the shop's limited ceiling height of 7' 9". (See *page 40* for the plan.) It includes a hinged containment stretcher for easy material removal. We even threw in extra storage for dowel rods that come in the form of two spaced sections of heavy-duty carpet tubing.

MOBILE BASES

Three HTC mobile bases (Wilkemachinery.com or call 717/764-5000) added to the larger power tools significantly improved Mark's workshop mobility.



PROJECT 4: WALL CABINETS/OPEN SHELVES

Two simple wall cabinets perched above the new countertops make a huge difference in the small shop's available storage space. Because surface mounted conduit prevented us from mounting the cabinets together, we used the opportunity to add adjustable shelving between the two. As a final touch, shop brushes find a handy home on the cabinet side. (See *page 41* for construction details.)

LARGE POWER TOOL RECESS

Leaving space underneath the countertops allowed us to store and protect Mark's 8" jointer. The space is large enough to alternate as a temporary home for the tablesaw as well.

LUMBER RACK

Triton's sturdy lumber rack (rockler.com or call 800/279-4441), mounted above the countertop, leaves Mark plenty of room for "current project" material and those special boards set aside for an heirloom to come.

5 Basic principles of workshop organization

Mobility—This makes a small shop work like a large one. To create mobility, mobile bases were added to Mark's tablesaw, 8" jointer, and 14" bandsaw. (The router, belt/disc sander, and planer already had wheels.) When the countertops and mitersaw station along one wall were added, resulting recesses served to house Mark's large jointer and roll-around cabinets. After two days, his shop had only three wheelless tools (the workbench, mitersaw station, and drill press).

Flexibility—Needs change from project to project and with each new tool purchase. The "Versa-cab" (see the *previous page*) offers the maximum in flexibility. Both shelves and drawers can be quickly relocated to meet changing storage needs. The Triton lumber rack system (*below left*) has movable arms. The large tool recess in the corner accommodates either Mark's mobile jointer or his mobile tablesaw.

Accessibility—Organization means little if you can't get to things easily. To create accessibility, we opened up Mark's floor space by creating sensible homes for all the large tools. (See the shop diagram on the *previous page*.) The open floor space dramatically improves workflow, providing obstruction-free access to all parts of Mark's shop.

Durability—There's no point in doing the work if it's not going to last. For the shop's work surfaces, birch plywood was used with hardwood edge strips; for the cabinetry, ¾" MDF with heavy-duty hardware. Mobile bases, made of welded steel for maximum strength and durability, made moving large, heavy tools easy. For protection of the bare wood surfaces of Mark's countertops and cabinets, he'll need to apply at least two coats of oil-based polyurethane to ensure lasting material stability.

Affordability—In addition to making sure that the shop components last, purchasing them at a low or reasonable price also proved important. (See "Where the money went" on *page 41*.) In Mark's shop, all the materials for the cabinetry and countertop cost less than $440 for five cabinets, multiple drawers and shelving, and more than 32 square feet of countertop. Less than $40 was spent on the plywood holder.

To begin planning your shop, see the tool templates and grid in the *WOOD Patterns*® insert.

Project 1: "Versa-cab" tool cabinet system

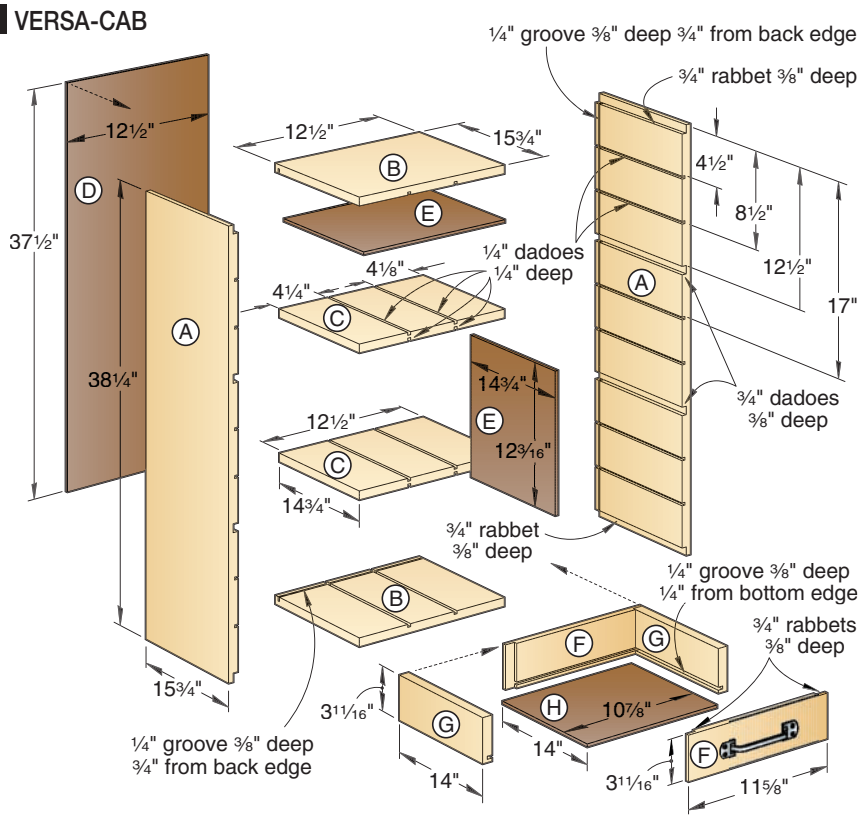
This simple cabinet design, **Drawing 1**, offers the ultimate in versatility, hence the name. It accommodates multiple drawers, shelves, or vertical dividers—or a mix of all three. Place it vertically as a base cabinet on the floor or mount it vertically or horizontally on the wall. Because the dividers lay loosely in their slots, the layout of each cabinet can be quickly reconfigured to meet changing needs. The cabinet size makes optimum use of a sheet of medium-density fiberboard (MDF), and the spacing between the dividers proves ideal for medium-size drawers and many smaller tools, tool cases and other items.

Overall, the cabinet measures (when vertical) 15¾" deep, 13¼" wide, and 38¼" high. At its most basic, it has three equal compartments of 11¾×11¾×14¾". The individual spaces, with dividers installed, are 3¾" wide.

When routing the ¼" wide, ⅜" deep grooves for the cabinet backs and drawer bottoms, make certain the ¼" hardboard fits somewhat loosely into the grooves. If the fit is too tight, the remaining lip may split away from the MDF. As you assemble the cabinet carcase and the drawer boxes, glue the ¼" hardboard into the grooves for extra strength.

We found that once all the parts are cut and routed, and assuming you have a finish nailer, each cabinet, including three drawer boxes, can be assembled in about an hour.

1 VERSA-CAB



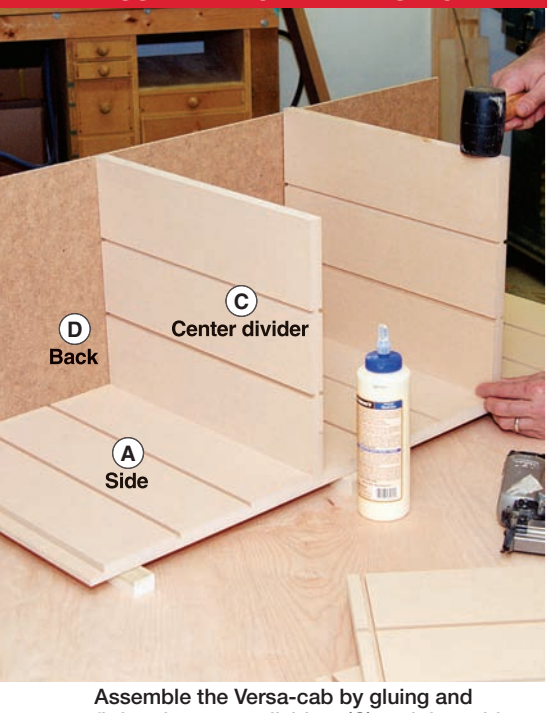
Materials List

	Versa-cab	FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	¾"	15¾"	38¼"	MDF	2
B	top and bottom	¾"	15¾"	12½"	MDF	2
C	center dividers	¾"	14¾"	12½"	MDF	2
D	back	¼"	12½"	37½"	HB	1
E	partitions	¼"	12³⁄₁₆"	14¾"	HB	6
F*	drawer front and back	¾"	3¹¹⁄₁₆"	11⅝"	MDF	2
G*	drawer sides	¾"	3¹¹⁄₁₆"	14"	MDF	2
H*	drawer bottoms	¼"	10⅞"	14"	HB	1

* Quantity for one drawer

Materials Key: MDF–medium-density fiberboard, HB–hardboard.

ASSEMBLING THE VERSA-CAB



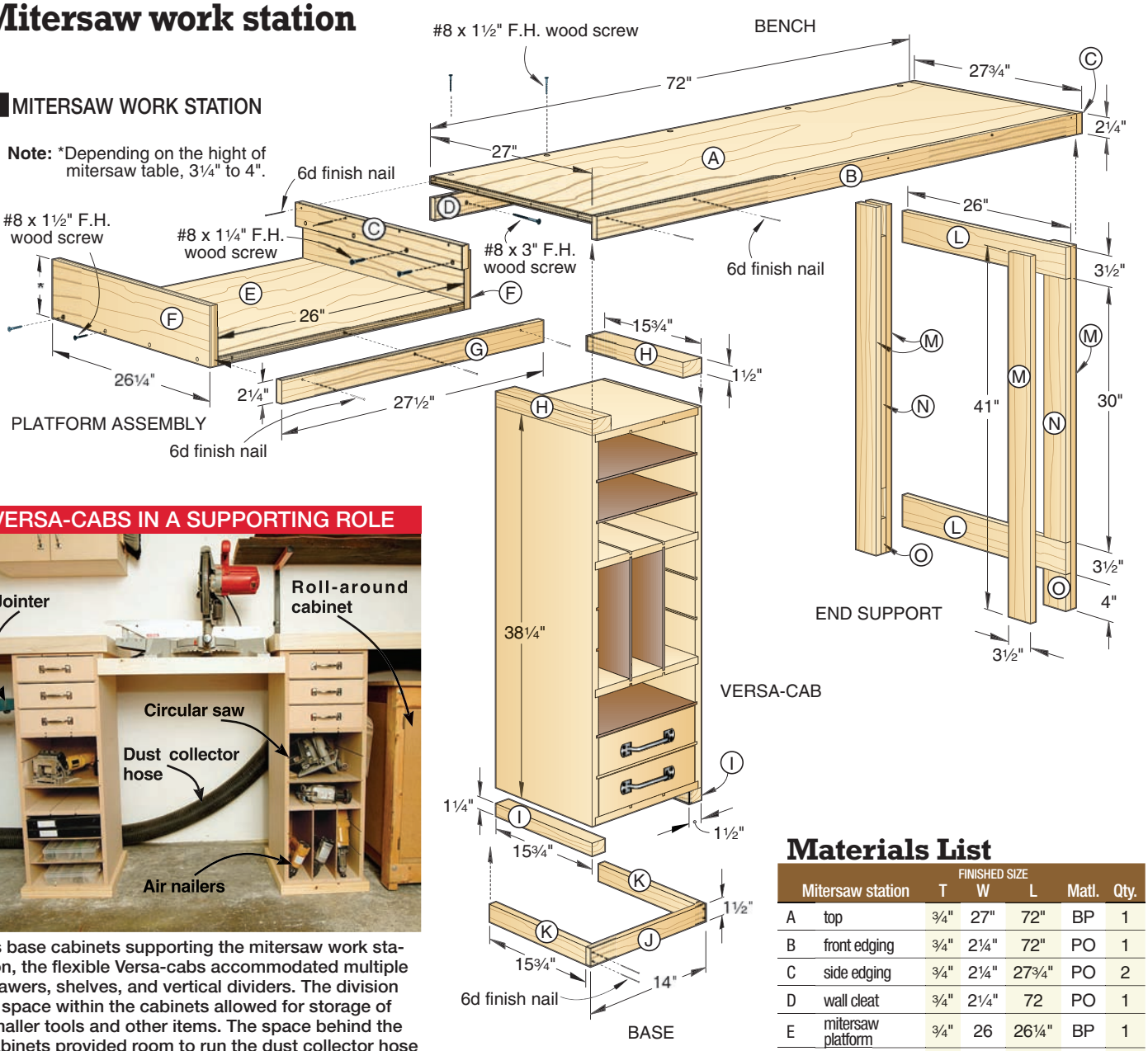
Assemble the Versa-cab by gluing and fitting the center dividers (C) and the cabinet back (D) into the sides (A). Glue and nail the dividers and cabinet ends, square the cabinet, and then nail through the back into the dividers to stiffen the cabinet.

SLIDE-IN SAW BLADE STORAGE

For wall installation, add a horizontal cleat inside the cabinet and to its back securing it to the sides. Then drive screws through the cleat and back and into the wall studs. To increase the versatility of the partitions, add a dowel for storing circular saw blades of 10" or less.

Project 2: Mitersaw work station

2 MITERSAW WORK STATION



VERSA-CABS IN A SUPPORTING ROLE

As base cabinets supporting the mitersaw work station, the flexible Versa-cabs accommodated multiple drawers, shelves, and vertical dividers. The division of space within the cabinets allowed for storage of smaller tools and other items. The space behind the cabinets provided room to run the dust collector hose out of the way and to the jointer.

As with most workshops, the mitersaw serves as one of the busiest tools in Mark's shop, and it needed a permanent home. Mark needed additional work surface and storage capacity. These needs were met by installing a mitersaw work station along the 18' right-hand wall (looking in from the garage doorway). The mitersaw work station was centered on the wall to allow maximum cutting length to the left or right.

Two Versa-cabs (see **Drawing 1**), installed as base cabinets, support the countertops on either side of the mitersaw. Wall cleats (D) were screwed into wall studs to support the back of the countertop and the outside end of the left countertop. If you don't carry the countertop all the way to the corner, build the end support shown in **Drawing 2**. Either solution will provide firm support.

Mark's shop had an uneven and sloped concrete floor that required a little extra effort when setting the base cabinets. To solve the problem, the position of the base cabinets was located, and then measured up from the highest spot on the floor. The top of the wall cleat was positioned 41" from this high spot to allow the Versa-cab base cabinets to fit underneath the countertop, as shown in **Drawing 2**. Next, a 48"-long level line was drawn from this mark. We lengthened the level line across the entire wall with a chalk line and used the mark to install the wall cleats. Because of this

Materials List

	Mitersaw station	FINISHED SIZE T	W	L	Matl.	Qty.
A	top	¾"	27"	72"	BP	1
B	front edging	¾"	2¼"	72"	PO	1
C	side edging	¾"	2¼"	27¾"	PO	2
D	wall cleat	¾"	2¼"	72	PO	1
E	mitersaw platform	¾"	26	26¼"	BP	1
F†	platform supports	¾"	3½"	26¼"	BP	2
G	platform edging	¾"	2¼"	27½"	PO	1
H*	top cleats	1½"	2"	15¾"	P	2
I*	bottom cleat	1½"	1¼"	15¾"	P	2
J*	front base trim	¾"	1½"	14"	P	1
K*	side base trim	¾"	1½"	15¾"	P	2
L	end support crossrails	¾"	3½"	26"	P	2
M	outer legs	¾"	3½"	41"	P	4
N	long leg fillers	¾"	3½"	30"	P	2
O	short leg fillers	¾"	3½"	4"	P	2

* Quantity for one cabinet

† 3½-4", depending on mitersaw table height

Materials Key: BP–birch plywood, P–pine, PO-poplar.

Continued on page 40

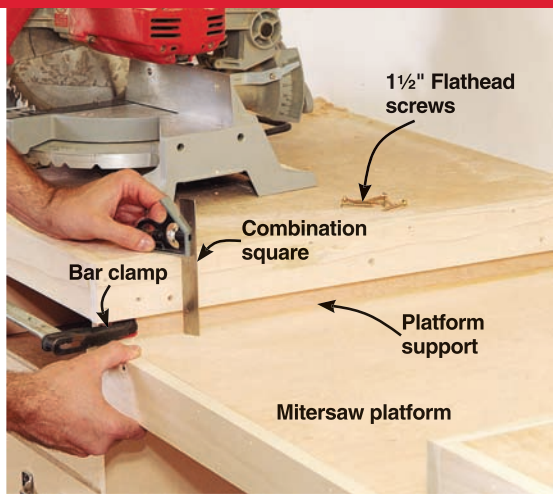
floor variation, the height of the end supports was adjusted until level with the line.

With the countertops installed but not attached to the base cabinets, the base cabinets were positioned and leveled to maintain 27½" between the sides of the cabinets. This spacing left a ¾" gap between the side of the base cabinet and the countertop side edging (C). The gap left space to maneuver the mitersaw platform support (F) into the correct position. We then attached the countertops to the base cabinets through the upper top cleats (H).

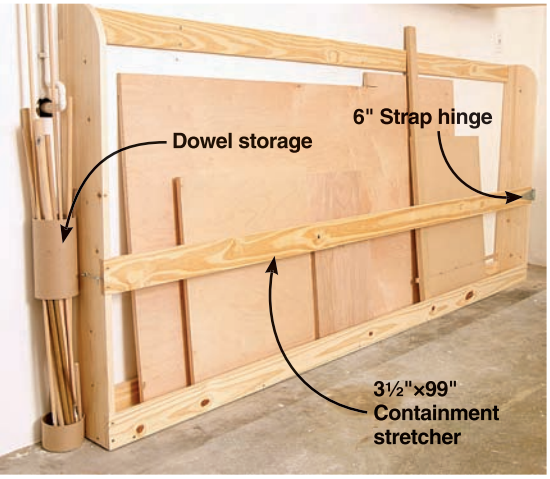
A long straightedge was placed across both countertops to act as a guide while leveling and plumbing the base cabinets. In this case, one of the bottom cleats (I) was shaved, and added cedar shims were used where needed to even up cabinets. Nails were driven through the cabinet bottom to hold the bottom furring strips in place. The bottom of the cabinets were secured to the floor by applying concrete-compatible silicone to the trim parts (J, K) before nailing them in place. The end result: a perfectly level countertop.

FIGURING THE PLATFORM HEIGHT

To align the top surface of the mitersaw with the top surface of the adjacent work-surface top, we used a combination square and measured down from Mark's mitersaw table, as shown. We then trimmed the width of the platform supports (F) to that measurement, less ¼". This measurement gap provides adjustability for the platform positioning without sacrificing strength.

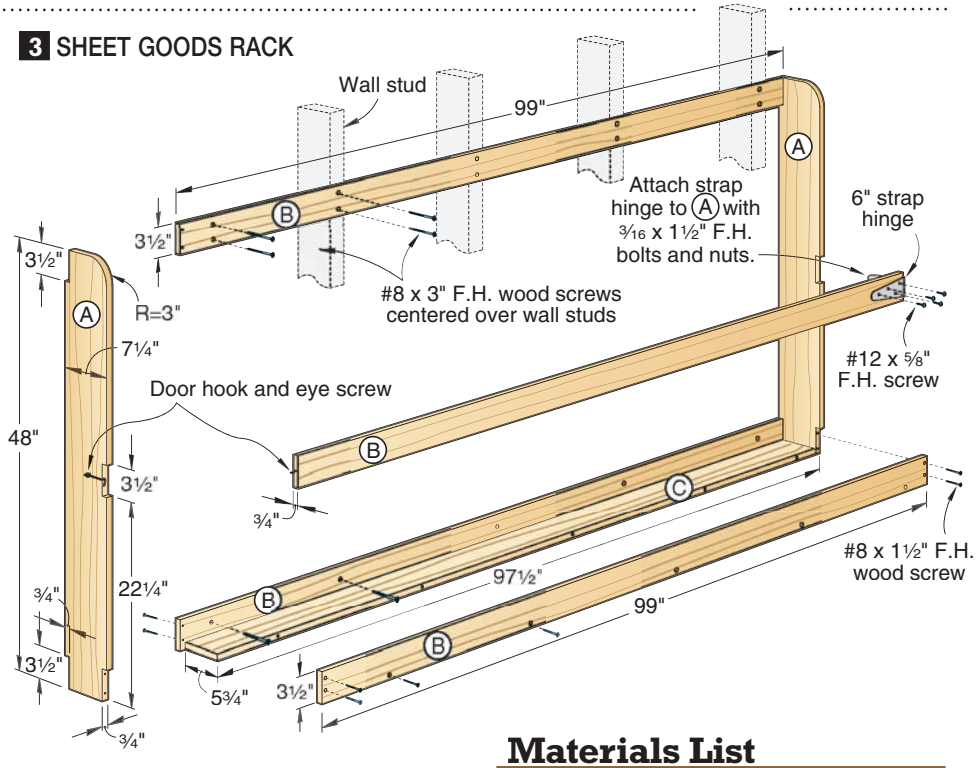


Set the depth of the front of the mitersaw platform first by sliding the platform supports (F) behind the countertop edging (C). Clamp the platform supports to the neighboring cabinet sides. Set the depth of the platform's back, and screw it in place at that location. Return to the front, recheck the depth, and finish screwing the platform in place. Add the mitersaw and recheck the height.



The lower (containment) stretcher (B) of the sheet goods rack is held in place by a 6 in. strap hinge bolted to the rack's side and a "hook and eye" at the other end.

3 SHEET GOODS RACK



Project 3: Sheet goods rack

Shops need a place to store sheet goods, including sheet good scraps. Mark's shop is no exception. However, the limited ceiling height (7'-9") of Mark's garage shop required some special considerations. To meet that need, we built a rack for horizontal storage with enough space inside for 97"-long sheets of MDF. (See **Drawing 3**.)

Because the wall-mounted cabinetry above the holder prevents placing full sheets in the holder by lifting them over the lower containment stretcher, we designed a "swing-out" containment stretcher (B) that improves the accessibility of the rack and reduces the amount of lifting necessary to store sheets.

The trough at the bottom of the rack contains the materials in a defined and generous space. The rear stretcher at the top allows you to firmly mount the rack to wall studs. To add versatility, we also mounted two short sections of heavy-duty cardboard carpet tubing (shown *above left*) to the side for containing dowels and other thin-strip material.

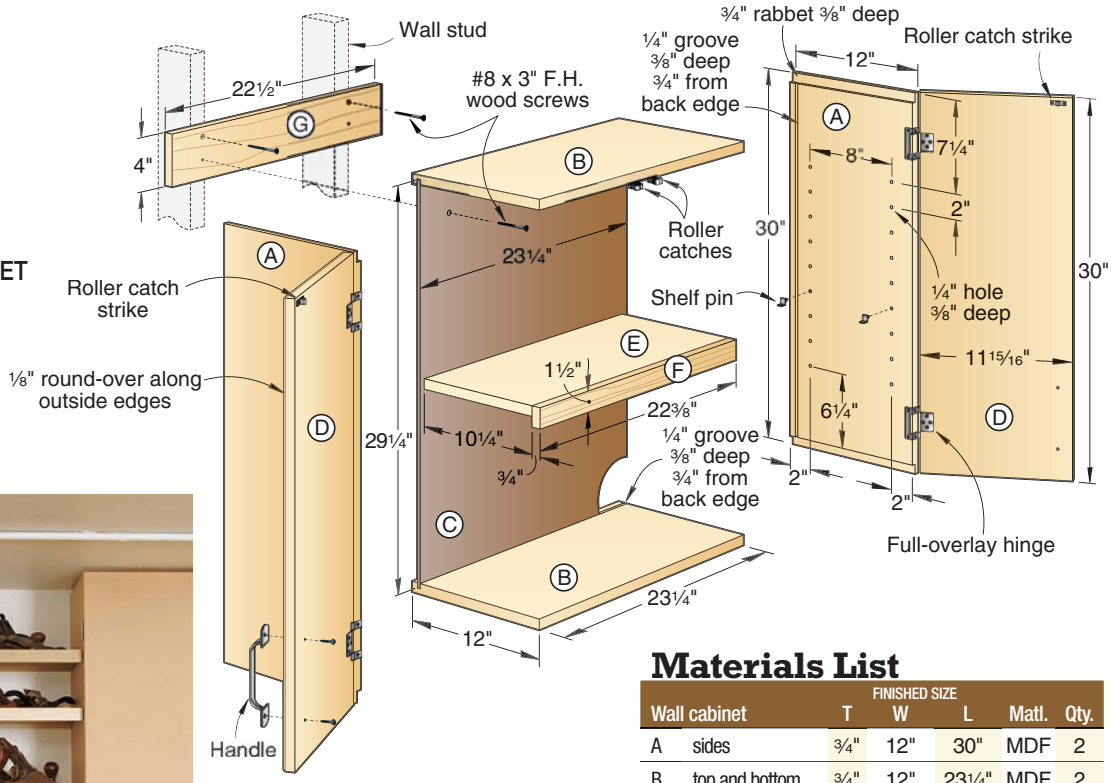
Materials List

Sheet goods rack		FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	¾"	7¼"	48"	P	2
B	stretchers	¾"	3½"	99"	P	4
C	bottom	¾"	5¾"	97½"	P	1

Materials key: P–pine.

Two wall cabinets were mounted 18" above the countertop beside the mitersaw work station. The 18" space between the cabinets allows them to support adjustable shelving for added storage.

4 WALL CABINET



Project 4: Wall cabinet

Most shops require at least some degree of protected storage where dust can't enter. This basic wall cabinet meets that need simply, affordably, and quickly.

Cut the parts shown in **Drawing 4** to size. If making a pair of cabinets that support shelving in between, first determine which cabinet sides will support the shelving. On these sides, drill the holes for the shelf pins all the way through, where shown. This way, the holes can house a shelf pin on either side. Next, drill ¼" holes ⅜" deep on the interior faces of the opposing cabinet sides.

Assemble the cabinet carcase and dry-fit the ¼" back in place to ensure that it's not so tight as to risk splitting off the lip behind. Then glue the ¼" backing into the ¼" groove, and glue and nail the sides, top, and bottom together. To ease assembly and hanging, align and pre-drill the hinge holes for the doors, but don't mount the doors until after hanging the cabinet. Install the cleat on the cabinet by using glue and nailing into the ends of the cleat and into the cabinet sides.

Using 3" deck screws, we installed the cabinets to wall studs, where shown, checking for level.

Materials List

	Wall cabinet	FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	¾"	12"	30"	MDF	2
B	top and bottom	¾"	12"	23¼"	MDF	2
C	back	¼"	23¼"	29¼"	HB	1
D	doors	¾"	11⁵⁄₁₆"	30"	MDF	2
E*	shelves	¾"	10¼"	22⅜"	MDF	2
F*	shelf edging	¾"	1½"	22⅜"	PO	2
G	wall cleat	¾"	4"	22½"	PO	1

* Optional shelf and shelf edging quantiity, depending on need.
Materials key: MDF–medium-density fiberboard, HB–hardboard, PO–poplar.

Where the money went

All in all, the workover at Mark's workshop was limited to a budget of $1,000, making the changes affordable. There was even cash left over. Here's a list of purchases and what they cost:

Bandsaw mobile base	**$106**
Jointer mobile base	**106**
Tablesaw mobile base	**80**
¾" medium-density fiberboard (MDF) (5 sheets)	**142**
¼" hardboard (4 sheets)	**47**
¾" birch plywood (3 sheets)	**108**
¾" poplar and pine	**76**
Triton lumber rack	**82**
Assorted hardware	**84**
TOTAL	**$831**

Written by **Mike Satterwhite**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine**
Photography: **Richard McNamee**

at-your-service

dresser-top valet

Keep personal items organized and handy in this stylish accessory.

Do you hunt for your keys in one place, and your watch, cell phone, or jewelry in others? This handsome project, which has open and drawer storage, puts an end to the frustrating searches by giving such items a centralized home. For a rich look, the case is made from mahogany and accented with easy-to-install burgundy cloth-backed vinyl on the top and in the drawer. Don't know where to find the materials? Relax—a kit listed in **Sources** contains everything you need to make it.

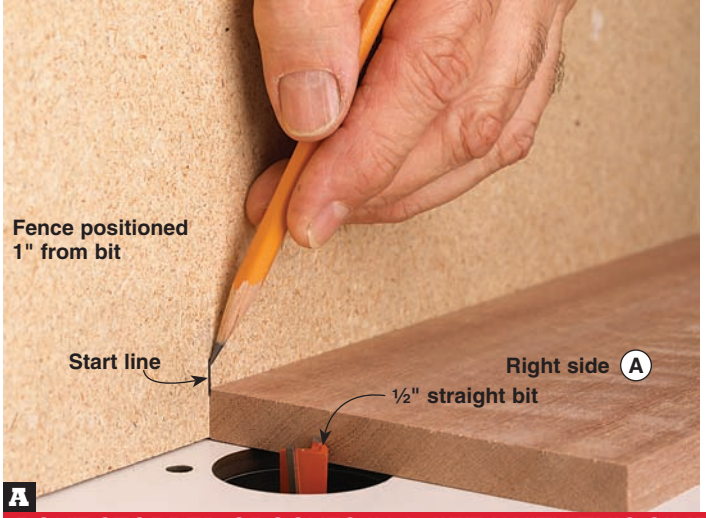
Start with the case parts

1 From ½"-thick stock (we used mahogany), cut the sides (A), back (B), and long divider (C) to the sizes listed in the **Materials List**.

2 To rout a ½" stopped groove ¼" deep in the mirror-image sides (A), where dimensioned on **Drawing 1**, chuck a ½" straight bit in your table-mounted router. Position the fence 1" from the bit to rout the *right* side first. Draw a start line on the fence, as shown in **Photo A**. Then, on masking tape, draw a stop line on the *outside* face of both sides 7¾" from the front end at the *top* edge of the *right* side and *bottom* edge of the *left* side.

Rout the groove in the *right* side, as shown in **Photo B**. Reposition the fence 3" from the bit. Now, rout the groove in the *left* side with the *bottom* edge against the fence. Square the groove ends with a chisel.

A shallow drawer lets you keep small items, such as jewelry, organized and out of sight.

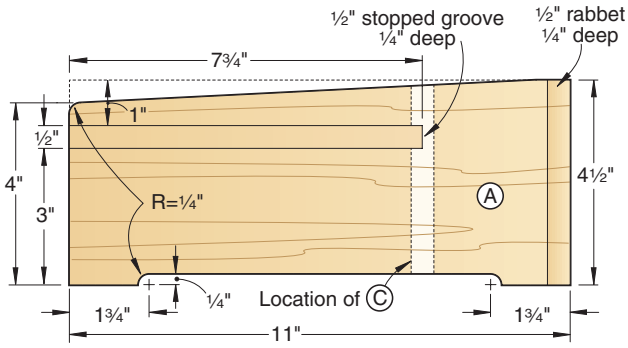


ROUT STOPPED GROOVES IN A JIFFY WITH THIS SIMPLE PROCESS

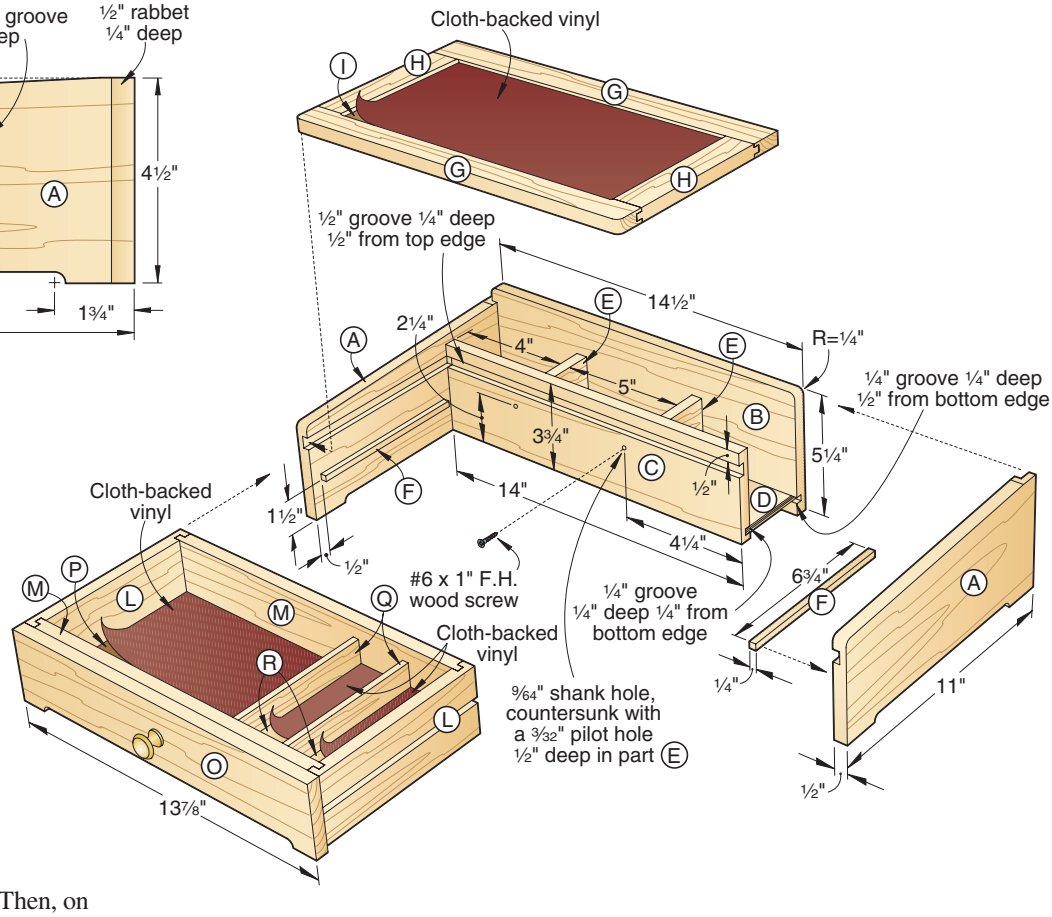
Position the right side (A) flush against the router-table fence and straight bit. Draw a start line on the fence at the end of the part.

Keeping the top edge of the right side tight to the fence, rout the groove, stopping when the start and stop lines align.

1 SIDE (Inside face of left side shown)



2 EXPLODED VIEW



AT A GLANCE

- Overall dimensions are 15" wide × 11⅜" deep × 5¼" high.
- For the board feet of lumber and other items needed to build this project, see *page 46*.

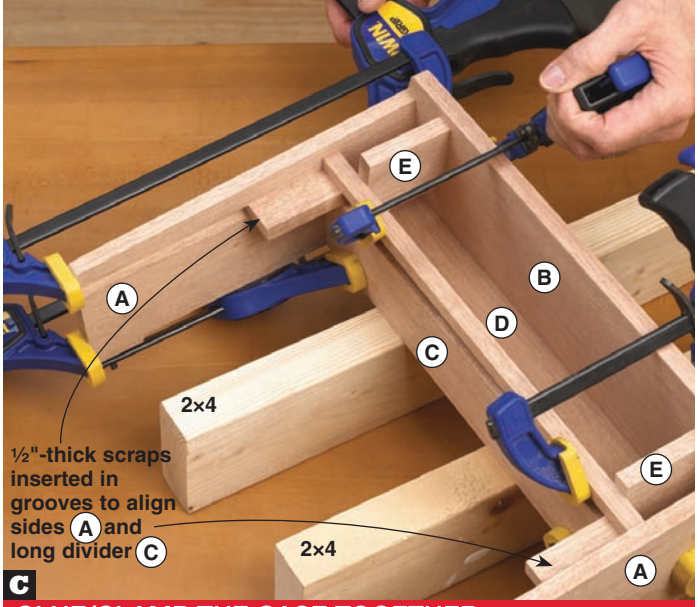
3 Repositioning the fence and using the same bit setup, cut a ½" rabbet ¼" deep along the *inside* face of the sides (A) at the back end, where shown on **Drawing 1**. (We used a pushblock as a backer to avoid tear-out.) Then, on the *front* face of the long divider (C), cut a ½" groove ¼" deep ½" from the *top* edge, where shown on **Drawing 2**.

4 On the *front* face of the back (B), cut a ¼" groove ¼" deep ½" from the *bottom* edge to fit your ¼" plywood for the bottom (D), where shown. (Do this in two passes using a standard blade in your tablesaw.) Then cut the mating groove for the bottom on the *back* face of the long divider (C) ¼" from the *bottom* edge.

5 On the sides (A), mark the cutout with radiused ends at the bottom and the tapered top edge with radiused front end, where dimensioned on **Drawing 1**. Bandsaw and sand to the lines. Then lay out the radii at the top ends of the back (B), where shown on **Drawing 2**. Sand the radii to shape.

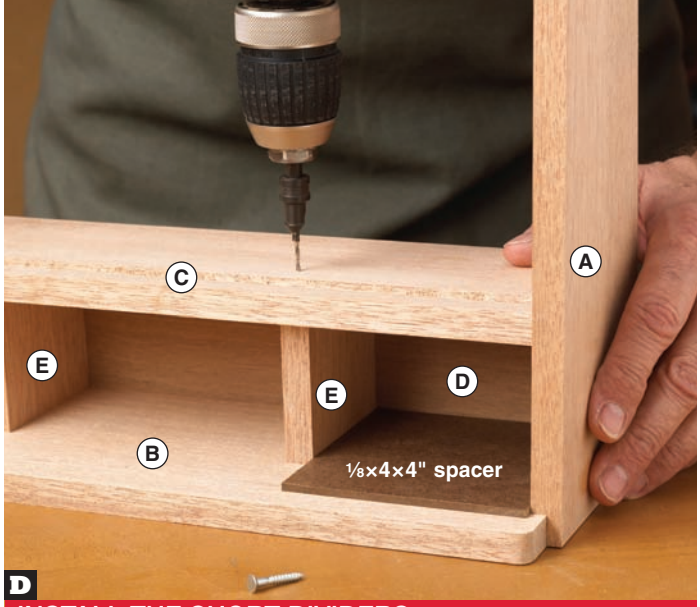
6 From ¼" mahogany plywood, cut the bottom (D) to the size listed. Then, from ½"-thick stock, cut the short dividers (E) to size. (Because only one screw holds the short dividers in the case, the parts must fit snugly to stay securely in place.)

7 To form the drawer guides (F), plane a ½×2×14" piece of stock to ¼" thick. Rip a ¼"-wide strip from the blank. Then crosscut two 6¾"-long guides from the strip. Save the remaining stock to make the short panel stops (J) and long panel stops (K) for the top assembly later.



C GLUE/CLAMP THE CASE TOGETHER

Clamp the case together using the short dividers (E), without glue, and ½"-thick scraps to position/align the long divider (C).



D INSTALL THE SHORT DIVIDERS

Position a short divider (E) tight against the ⅛×4×4" spacer and case bottom (D). Drill the mounting hole, and drive the screw.

Assemble the case

1 Apply glue in the rabbets of the sides (A) and to the ends of the long divider (C). Also apply a small amount of glue in the ¼" grooves in the long divider and back (B) for the plywood bottom (D). Assemble and clamp parts A, B, C, and D together, using the short dividers (E) as spacers to position the long divider (C) and ½"-thick scraps to align the grooves in the sides (A) and long divider, as shown in **Photo C**. (The long divider sits ¼" above the bottom edges of the case sides.) Set the case on scrap 2×4s to allow room for the clamps. Check for square.

2 To mount the short dividers (E), mark centerpoints for two mounting holes on the front face of the long divider (C), where dimensioned on **Drawing 2**. (We did not use glue on the dividers because it would be difficult to remove the squeeze-out.) Then cut a ⅛×4×4" spacer from hardboard. Set the case on the back (B). Now position a short divider (E) in the case with the spacer, as shown in **Photo D**. Drill the mounting hole, and drive the screw. Repeat for the other divider.

3 To position the drawer guides (F) on the case sides (A), where dimensioned on **Drawing 2**, cut a ⅛×1½×7½" spacer from hardboard. Set the case on a flat work surface with the bottom down. Clamp the spacer to the *inside* face of the left case side flush with the work surface and tight against the long divider (C). Apply glue to the back face of a drawer guide, and clamp it to the side, tight against the spacer and ½" back from the front end of the case side. Remove the spacer. Repeat to adhere the remaining guide to the right case side.

Head for the top

1 Cut the stiles (G) and rails (H) for the top to the sizes listed. Save the rail cutoffs to make test tenons. Using a dado blade in your tablesaw, cut a centered ¼" groove ¼" deep on the *inside* edges of the stiles and rails, where shown on **Drawing 3**.

2 To form tenons on the rails (H), where shown, attach an auxiliary fence to your saw fence and an auxiliary extension to the miter gauge. Then cut ¼" rabbets ⅛" deep on a rail cutoff to form a ¼"-long ¼"-wide tenon. Test-fit the tenon in the stile grooves. Adjust your setup, if needed, and cut the tenons on both ends of each rail.

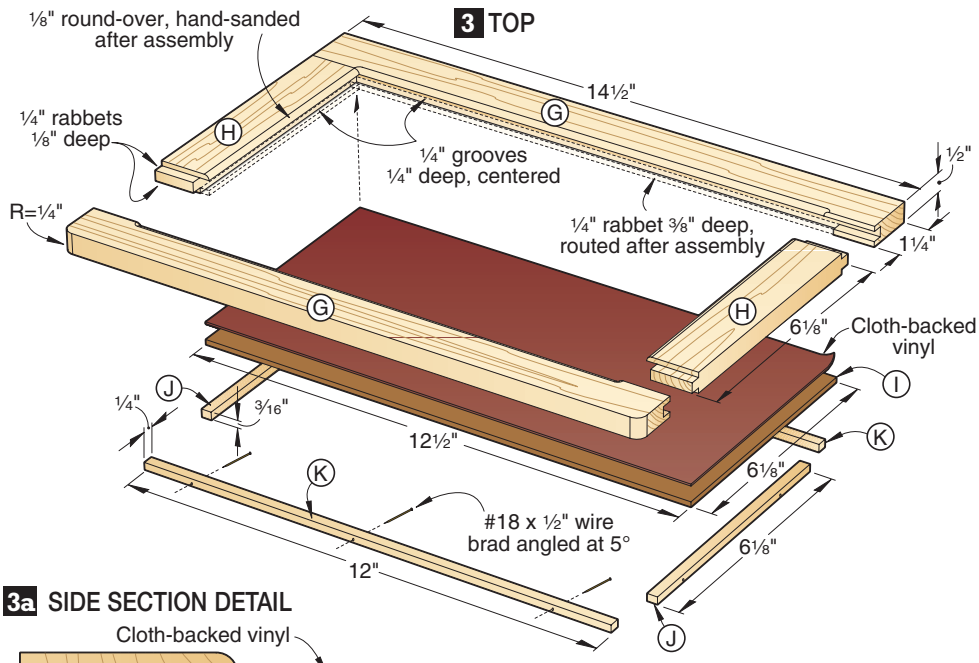
3 Glue and clamp the stiles (G) and rails (H) together, checking for square. After the glue dries, sand the joints smooth.

4 Using a ¼" rabbeting bit in your router, rout a ¼" rabbet ⅜" deep along the *inside* edges of the stile/rail assembly (G/H) on the *bottom* face, where shown. (This removes the bottom lip of the centered ¼×¼" grooves.) Square the corners with a chisel. Then hand-sand ⅛" round-overs along the *top inside* edges of the assembly, where shown, using 180-grit sandpaper.

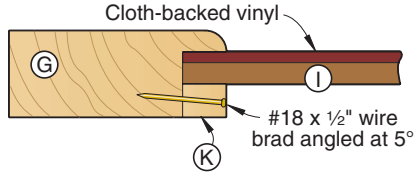
5 Mark ¼" radii on the ends of the front stile (G). Sand the radii to the lines.

6 From ⅛" hardboard, cut the panel (I) to 6⅛×12½". Set the panel aside.

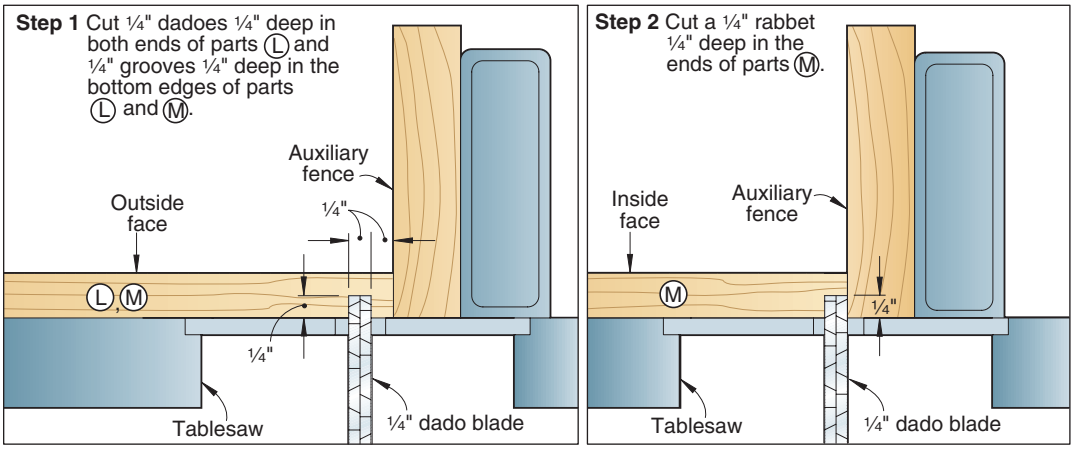
7 To form the short and long panel stops (J, K), retrieve the remaining piece of



3a SIDE SECTION DETAIL



5 MACHINING THE DRAWER FRONT/BACK AND SIDES


Step 1 Cut ¼" dadoes ¼" deep in both ends of parts (L) and ¼" grooves ¼" deep in the bottom edges of parts (L) and (M).
Auxiliary fence
Outside face
¼"
(L), (M)
¼"
Tablesaw
¼" dado blade
Step 2 Cut a ¼" rabbet ¼" deep in the ends of parts (M).
Inside face
Auxiliary fence
(M)
¼"
Tablesaw
¼" dado blade

¼"-thick stock used to form the drawer guides (F). Rip three 3⁄16"-wide strips from the piece. Crosscut one strip to form two 6⅛"-long short panel stops (J) to fit the rabbeted recess in the stile/rail assembly (G/H). Then trim the remaining two strips to 12" long for the long panel stops (K) to fit between the short panel stops. Set the stops aside.

8 Apply a small amount of glue in the ½" grooves in the sides (A) and long divider (C). Then slide the stile/rail assembly (G/H) into the grooves, and clamp it to the case.

Slide over to the drawer

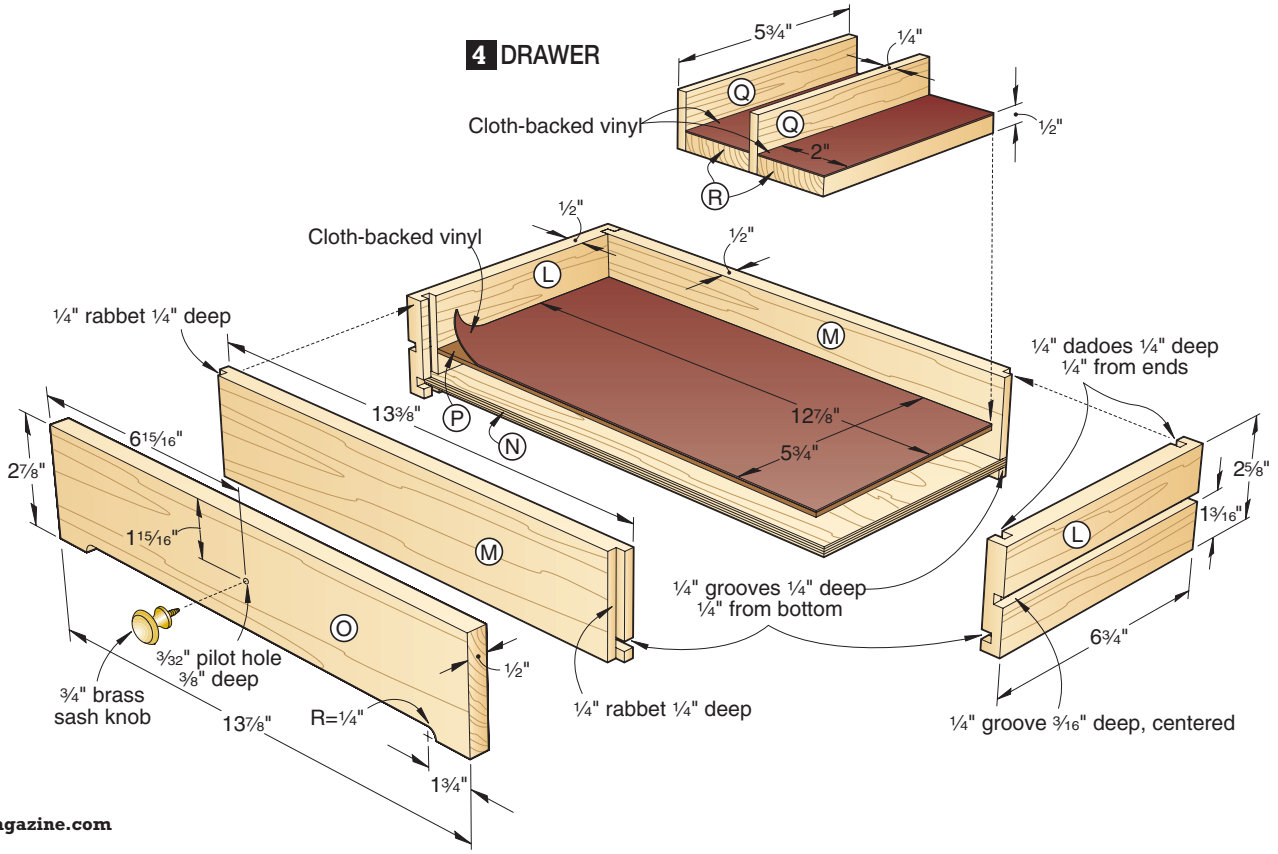
1 From ½"-thick stock, cut the drawer sides (L) and front/back (M) to size. Referring to **Drawing 4** and the two-step **Drawing 5** for the machining setups, cut the ¼" dadoes and rabbets to form the locking joints and the ¼" grooves to fit the plywood bottom (N), where shown.

2 Lower your dado blade to 3⁄16". Then cut a centered ¼" groove on the *outside* face of the sides (L), where dimensioned on **Drawing 4**, to fit the drawer guides (F). Slide the sides on the guides to check the fit. The sides need to glide smoothly without looseness. Adjust the groove width, if needed, to achieve the desired fit.

3 From ¼" mahogany plywood, cut the bottom (N) to size. Then sand the drawer parts to 220 grit. Now glue, assemble, and clamp the drawer together with the bottom captured in the grooves. Check for square.

4 From ½"-thick stock, cut the drawer face (O) to the size listed. As you did for the case sides (A), lay out, bandsaw, and sand the cutout with radiused ends at the bottom, where dimensioned on **Drawing 4**. Then mark a centerpoint on the *front* of the drawer face for mounting a ¾" brass sash knob, where dimensioned. Drill the pilot hole. You'll install the knob later.

5 To adhere the drawer face (O) to the drawer, centered in the case opening, cut four 1⁄16×¾×2½" spacers from scrap. On a flat work surface, slide the drawer in the case and position the spacers, as shown in **Photo E** on the *next page*. Apply glue to the *back* of the drawer face. Now position and clamp it to the drawer front (M), as shown,



E CENTER AND GLUE THE DRAWER FACE

With the 1/16" spacers positioned under the drawer and at the ends to center the drawer face (O), glue and clamp it to the front (M).

F TRIM THE VINYL ON THE PANELS

With the panels (I, P) bottom side up on a backer and using a sharp utility knife, trim the excess vinyl from the edges of the panels.

with the top edges of the face and front flush. After the glue dries, remove the drawer.

6 From ⅛" hardboard, cut the panel (P) to 5¾×12⅞" to fit inside the drawer. Set the panel aside.

7 From ½"-thick stock planed to ¼" thick, cut the drawer dividers (Q) to size to fit inside the drawer. Then, from ½"-thick stock, cut the divider spacers (R) to size. Glue a spacer to each divider in the configuration shown on **Drawing 4** with the bottoms flush.

Add the finishing touches

1 Finish-sand all parts to 220 grit, and remove the dust. Apply a stain, if you wish, and a clear finish to all parts except the hardboard panels (I, P) and top faces of the divider spacers (R). (We used Varathane Premium Wood Stain, no. 254 Red Chestnut, followed by three coats of Deft aerosol Satin Clear Wood Finish, sanding to 320 grit between coats.)

2 From cloth-backed vinyl (we used a burgundy color), cut two 7×14" pieces for the panels (I, P). Place the vinyl on your workbench with the cloth side up.

To adhere the vinyl to the panels, use either 3M Super 77 Spray Adhesive (available at home centers and art supplies stores) or five-minute epoxy. For the Super 77, spray the adhesive onto one face of the panels and to the cloth side of the vinyl. For the epoxy, apply it only to the panels, spreading it out evenly with the edge of a scrap piece of wood. Then, holding each panel with the adhesive side facedown, center and press it onto the vinyl. Turn the panels over, and firmly adhere the vinyl using a 3" rubber J roller. Now trim the vinyl, as shown in **Photo F**.

3 Measure and cut vinyl pieces to fit the divider spacers (R), where shown on **Drawing 4**. Mask all but the top face of the spacers. Then apply adhesive, and position and press the vinyl onto the spacers.

4 To install the panel (I) and short and long panel stops (J, K) in the top, where shown on **Drawing 3**, position the case with the bottom up. Place the panel, vinyl side down, in the rabbeted recess in the top. To prevent splitting the stops when attaching them with #18×½" wire brads, predrill pilot holes angled at 5° through them, where shown on **Drawings 3** and **3a**, using a #18×1" wire brad with the head snipped off. Set the stops in position on the panel. Drive the brads using a tack hammer.

5 Finally, install the ¾" brass sash knob on the drawer face (O). Then place the panel (P) and dividers (Q/R) in the drawer, and slide the drawer in the case. Now gather up your watch, jewelry, or other personal items, and place them in your masterfully crafted valet with pride.

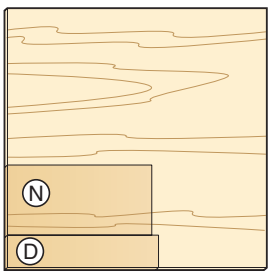
Materials List

Case		FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	½"	4½"	11"	M	2
B	back	½"	5¼"	14½"	M	1
C	long divider	½"	3¾"	14"	M	1
D	bottom	¼"	3"	14"	MP	1
E	short dividers	½"	2¾"	2½"	M	2
F*	drawer guides	¼"	¼"	6¾"	M	2
Top assembly						
G	stiles	½"	1¼"	14½"	M	2
H	rails	½"	1¼"	6⅛"	M	2
I	panel	⅛"	6⅛"	12½"	H	1
J*	short panel stops	¼"	3/16"	6⅛"	M	2
K*	long panel stops	¼"	3/16"	12"	M	2
Drawer						
L	sides	½"	2⅝"	6¾"	M	2
M	front/back	½"	2⅝"	13⅜"	M	2
N	bottom	¼"	6¼"	13⅜"	MP	1
O	drawer face	½"	2⅞"	13⅞"	M	1
P	panel	⅛"	5¾"	12⅞"	H	1
Q	dividers	¼"	1½"	5¾"	M	2
R	divider spacers	½"	2"	5¾"	M	2

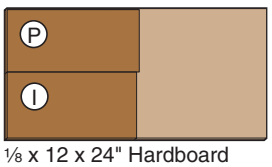
*Parts initially cut oversize. See the instructions.

Materials key: M–mahogany, MP–mahogany plywood, H-hardboard.
Supplies: #6×1" flathead wood screws (2); 15×16" cloth-backed vinyl, burgundy color (available at fabric stores); 3M Super 77 Spray Adhesive or five-minute epoxy; 3" rubber J roller; #18×½" and #18×1" wire brads.
Blades and bits: Dado-blade set, ½" straight and ¼" rabbeting router bits.

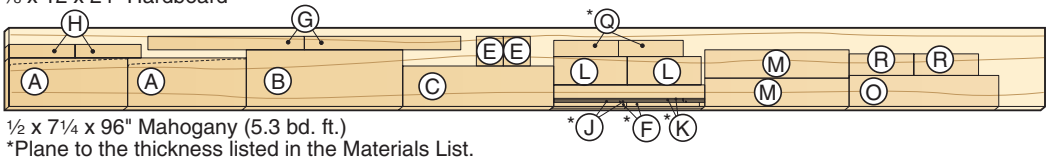
Cutting Diagram



¼ x 24 x 24" Mahogany plywood



⅛ x 12 x 24" Hardboard



½ x 7¼ x 96" Mahogany (5.3 bd. ft.)
*Plane to the thickness listed in the Materials List.

Written by **Owen Duvall** with **Chuck Hedlund**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine**

Sources

Lumber/hardware kit. Contains enough stock, cloth-backed vinyl, and a ¾" brass sash knob for one valet, kit no. 162, $49.95 ppd. To simplify project construction, stock is premachined to the listed thicknesses. Call Heritage Building Specialties 800/524-4184; heritagewood.com.
Sash knob. ¾" brass sash knob no. 162K, $7.95 ppd. Telephone number and Web address *above*.

chamfer plane

Cut crisp chamfers in a few quick strokes.

To chamfer an edge, simply ride the angled portion of the plane sole on one surface of the workpiece.

WOOD MAGAZINE COLLECTOR'S SERIES HAND TOOLS

Need to put a small chamfer on the edge of a tabletop or drawer front? Sanding is easy but won't give you crisp, uniform chamfers. Reaching for your router means setup time. This palm-sized hand tool offers a great solution. It's always set up and ready to go. And it's cordless!

First form the plane body

1 Cut a 1×1⅜×6" blank for the body (A). (We cut ours from 1¾"-thick maple. You may also laminate a blank from thinner stock.) Photocopy the body pattern on the *WOOD Patterns*® insert for the type of saw you own (right tilt or left tilt). Cut out the pattern, and adhere it to the side and one end of the body blank with spray adhesive, folding the pattern where indicated.

2 To form the angled sole on the plane body (A), tilt the blade 45° *away* from the fence, and adjust the depth of cut to match **Cut 1** on the pattern. (On a right-tilt saw, move the fence to the left of the blade. On a left-tilt saw, leave the fence on the right side of the blade.) Position the fence to align the blade with the angled pattern line, and make the cut, as shown in **Step 1** of **Drawing 1**. Then return the blade to vertical, adjust the depth of cut to match **Cut 2** on the pattern, align the blade with the pattern line, and make the cut, as shown in **Step 2**.

3 Crosscut the body (A) to finished length. Save the waste piece.

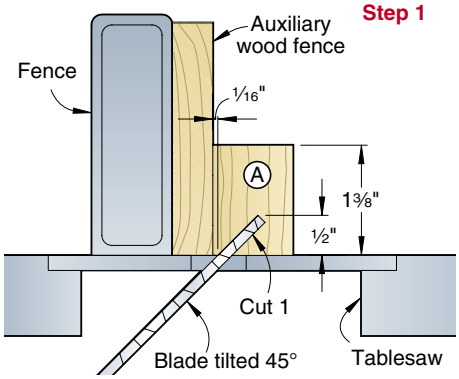
4 To form the throat in the plane body (A), first attach a 4"-tall auxiliary extension to your miter gauge. Adhere the body to the extension with cloth-backed, double-faced tape; tilt the blade to 20°; and make two cuts, as shown in **Tips 1** and **2**, *next page*. When making the cuts, push the body and extension all the way through the blade and switch off the saw. Do not pull the workpiece back through the spinning blade. (The photos show the cuts made on a right-tilt saw with the body and stopblock to the right of the blade. On a left-tilt saw, position the body and stopblock to the left of the blade.)

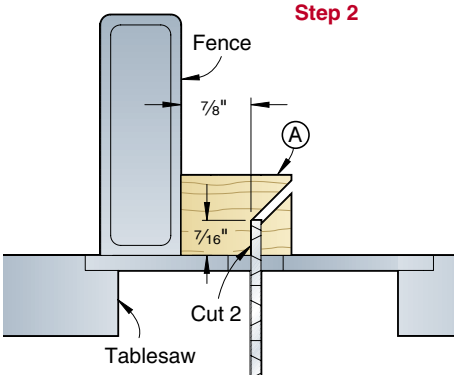
5 Disk-sand the radii on the body (A) corners, where shown on the pattern. Remove the pattern.

Now add the sides

1 Cut and plane a ¼×1½×8" blank for the sides (B, C). [We used bubinga (see **Source** on *page 49*) to match previous Collector's Series tools. Walnut and cherry are good alternatives.] Photocopy the left and right side patterns on the pattern insert, and adhere them to the blank with spray adhesive. Bandsaw and sand the parts to shape. Chuck a ⅛" round-over bit in your table-mounted router and rout the edges where indicated on the patterns, as shown in **Tip 3**, *next page*.

1 FORMING THE SOLE BEVEL



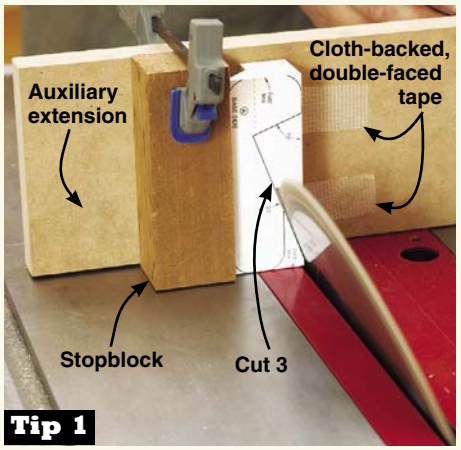


Safety tips for machining small parts

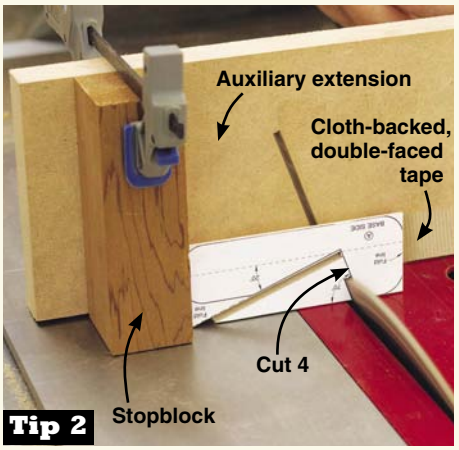
Tip 1: When part size or blade height makes it impossible to safely hold a part with your hand or a clamp while machining, secure it with cloth-backed, double-faced tape. As insurance against creep during machining, support the part with a stopblock.

Tip 2: When the waste is trapped, as shown, the double-faced tape securing the part to the auxiliary extension also prevents the waste from wedging against the blade and kicking back.

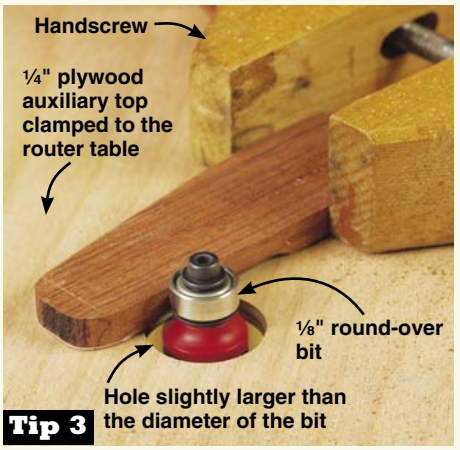
Tip 3: Many router table inserts have a hole sized to accommodate the largest commonly used bit and are not equipped with reducing rings. Attempting to machine a small part with a small-diameter bit centered in a large-diameter hole could spell trouble. Avoid a potential hazard by making an auxiliary table top, as shown. Then hold the part with a handscrew, repositioning the grip as you rout your way around the part.



Adjust the cut depth to match **Cut 3** on the pattern. Align the body (A) cutline with the blade, secure a stopblock, and make the cut.



Adjust the cut depth to match **Cut 4** on the pattern. Align the body (A) cutline with the blade, secure a stopblock, and make the cut.


Handscrew
¼" plywood auxiliary top clamped to the router table
⅛" round-over bit
Hole slightly larger than the diameter of the bit
Tip 3

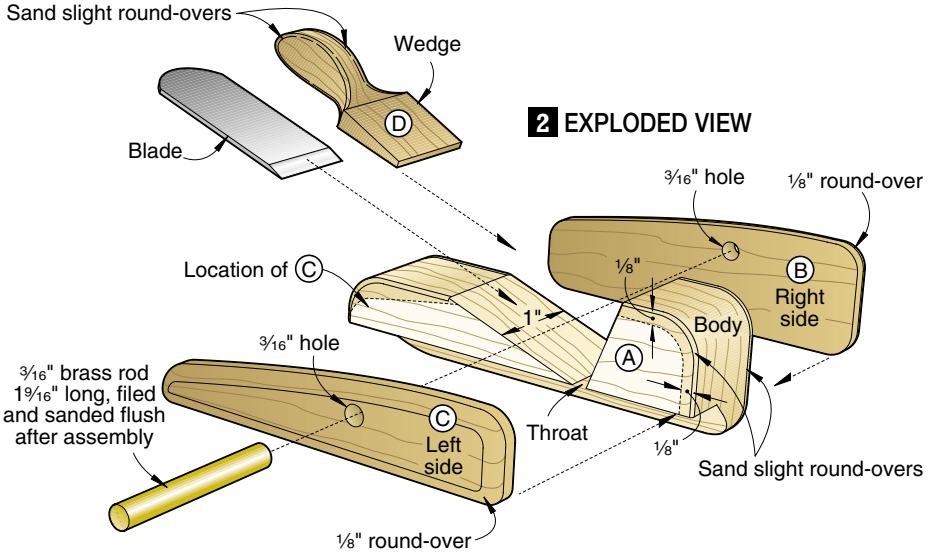
Drill a hole in a piece of ¼" plywood. Centering the router bit in the hole, clamp the plywood to the router table top.

2 Glue and clamp the right side (B) to the body (A), centered, where shown on **Drawing 2**. With the glue dry, glue and clamp the left side (C) to the body, centered front-to-back and flush at the bottom.

3 Retrieve the body waste piece, and use it to prevent tear-out when drilling the hole for the brass rod, as shown in **Photo A**.

4 Remove the body waste piece and side patterns and finish-sand the plane. Sand slight roundovers on the body (A) edges.

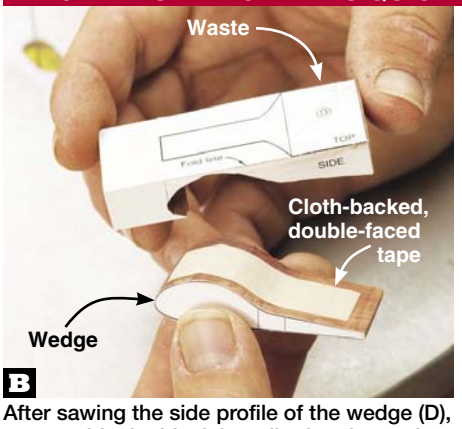
5 Hacksaw a piece of 3⁄16" brass rod to 1 9⁄16" long, and slide it through the holes in the sides, leaving about ¼" protruding from one side. Apply a drop of cyanoacrylate glue to the protruding rod, and then continue to slide it through the sides until an equal amount of rod (about 1⁄32") protrudes from both sides. With the glue cured, file and sand the rod flush with the sides.



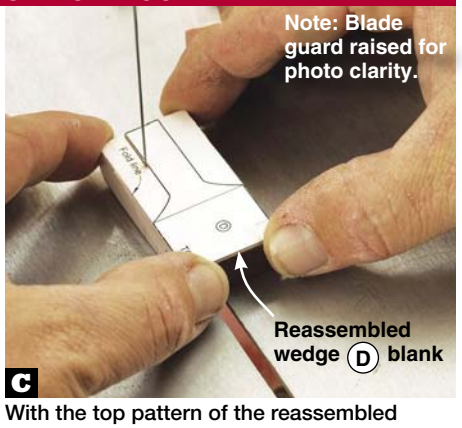
SIMPLE TEAR-OUT SOLUTION

Slide the body waste piece between the sides (B, C). Drill through both sides and the waste piece, where indicated on the pattern.

TWO-WAY SAWING MAKES QUICK WORK OF A COMPLEX PART



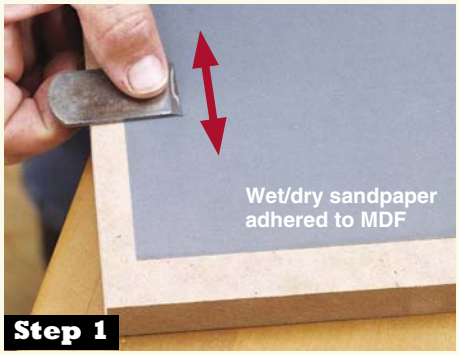
After sawing the side profile of the wedge (D), reassemble the blank by adhering the wedge to the waste with double-faced tape.



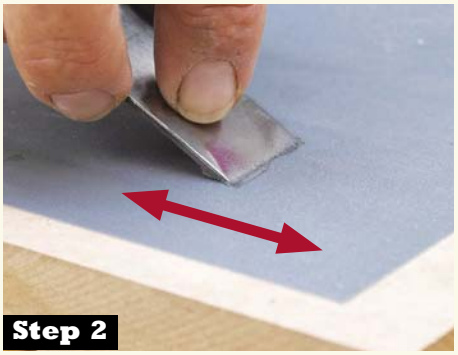
With the top pattern of the reassembled wedge blank facing up, trim the wedge to length and saw the top profile.

Go from factory edge to razor sharp in three easy steps

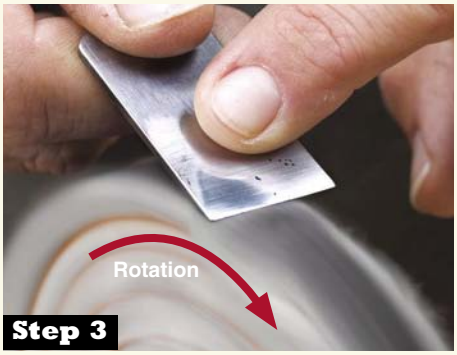
On just about any tool edge, out-of-the-box sharp just doesn't cut it. To make the chamfer plane, or any plane or chisel, really perform, you'll need to go beyond factory sharpening. First, adhere one sheet each of 220-, 320-, and 400-grit wet/dry sandpaper to pieces of a hard, flat material with spray adhesive. (We got great results with ¾" MDF. You also can use ¼" plate glass.) Now follow these steps.



Flatten the back of the blade, progressing through all three grits. Flatten one third to one half the length of the blade, making sure there are no uneven areas.



Holding the bevel flat on the sandpaper, sharpen it using a straight back-and-forth motion. Work through all three grits. A slight burr will form on the back.



Charge a buffing wheel with emery compound. With the cutting edge pointing in the direction of rotation, remove the burr and polish the back and bevel of the blade.

Fashion a locking wedge

1 Cut a ½×1×3" blank for the wedge (D). (We used the same species as the sides.) Photocopy the wedge pattern on the pattern insert. Adhere the pattern to the top and one side of the blank with spray adhesive, folding the pattern where indicated.

2 Install a #12 blade in your scrollsaw, and with the blank on its side (side pattern up), saw the wedge side profile. To allow for fitting the wedge later, cut about 1/32" to the waste side of the pattern line on the ramp portion of the wedge. Reassemble the wedge blank with cloth-backed, double-faced tape, as shown in **Photo B**. Then saw the top profile, as shown in **Photo C**. Separate the waste from the wedge.

3 Insert the plane blade (see **Source**) in the plane, and test-fit the wedge. Carefully sand the ramp portion of the wedge until it holds the blade tightly in place. Then finish-sand the wedge, slightly rounding the edges of the handle portion.

4 Apply a clear finish to all the parts. (We applied three coats of natural color Watco Danish Oil, following the directions on the can.) For a simple, surefire way to put a razor-sharp edge on the blade, see the sidebar, *above*. For tips on using your chamfer plane, see the sidebar, *below*. Now it's time to cut some corners.

Written by **Jan Svec**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine**

See more
Collector's Series Hand Tools at
woodmagazine.com/handtools

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	body	1"	1⅜"	3¾"	M	1
B*	right side	¼"	1⅛"	3½"	B	1
C*	left side	¼"	¾"	3½"	B	1
D*	wedge	½"	1"	2"	B	1

*Parts initially cut oversize. See the instructions.
Materials key: M–maple, B–bubinga
Supplies: Cloth-backed, double-faced tape, cyanoacrylate glue.
Blades and bits: #12 scrollsaw blade, ⅛" round-over router bit.

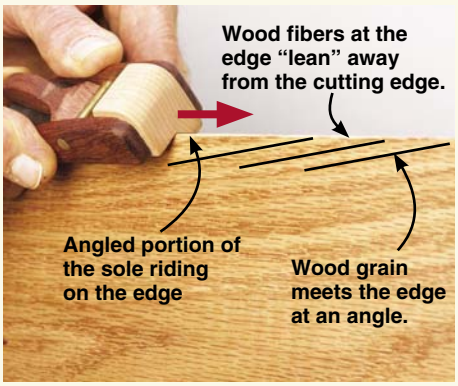
Source

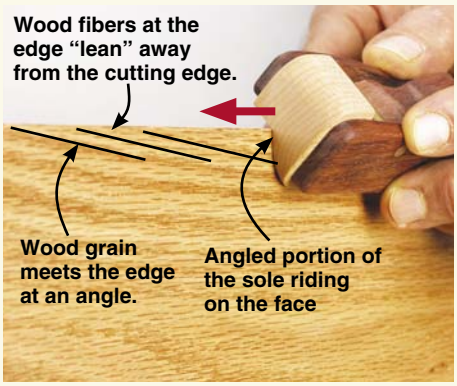
Hardware. 1/16×1×1⅞" plane blade, 3/16" brass rod 2" long. Kit no. PLN, $11.95 ppd., $7.95 ppd. for each additional kit. Schlabaugh and Sons, 720 14th St., Kalona, IA 52247. Call 800/346-9663, or go to schsons.com.
Wood. Maple and bubinga planed to thickness for the parts shown on the **Materials List**. Kit no. LP-12, $6.50 ppd. Schlabaugh and Sons, see *above*.

Using the chamfer plane

Set the blade in the plane with the cutting edge above the sole, and lock it in place with the wedge. Advance the blade and tighten the wedge by tapping the front end of the body with a mallet, as shown *below left*. You'll only need about 1/64" of blade showing. To loosen the wedge and remove the blade, tap the back end of the body.

To prevent tear-out where long grain meets an edge at an angle, plane so the wood fibers "lean" away from the cutting edge. Where the grain angle changes direction along the length of a part, plane from opposite ends with the angled surface of the plane sole resting on the edge of the part, as shown *below middle*, or on the face, as shown *below right*. When chamfering end grain, avoid splintering a corner by working from the corners of the part toward the center.


Wood fibers at the edge "lean" away from the cutting edge.
Angled portion of the sole riding on the edge
Wood grain meets the edge at an angle.


Wood fibers at the edge "lean" away from the cutting edge.
Wood grain meets the edge at an angle.
Angled portion of the sole riding on the face

try wood texturing

Give any project a dramatic new look using these simple techniques.

Wood's natural beauty begs to be unveiled by a woodworker's deft touch. Careful flattening and finishing reveals one aspect of that character, but texturing that same surface uncovers a whole new aspect.

For all their visual sophistication, these techniques require only basic router bits and a standard tablesaw blade. We'll demonstrate them by making decorative box lids, but you can apply similar techniques to everything from picture frames to drawer fronts. To make the box shown—minus the texturing effects—see the illustration on *page 53*.

Texture 1: in the groove

This grooved pattern—shown *opposite top* in maple—can be made with either pointed or flat peaks separating the grooves. We made these grooves using a 1"-diameter roundnose bit. This bit profile is available from ⅛ to 2" diameter.

To create this pattern, begin laying out router cut positions by marking the centerpoint on one edge or end of your workpiece. To the left of this center mark, place regularly spaced marks indicating the centerpoints of your grooves until you reach the edge, as shown in **Drawing 1**. Use a square to extend your marks the width of the end grain.

Adjust the bit height so that the final outside passes leave the edge shape you desire. Our box lids measure 6½" square with the bit height adjusted to cut grooves 1 3/16" apart by about 3/16" deep. That layout allows space for seven grooves ending with a partial concave on two edges.

Make practice cuts on scrap to adjust your feed rate to the wood you use—slow enough to avoid tear-out, but fast enough to prevent burning. This technique works best on square workpieces, but the dimensions and groove

Texture 1: Wavy lid with wavy sides

spacings can be coordinated to form patterns on rectangular pieces.

Position the router-table fence to align the center of the bit with the center mark on your workpiece, as shown in **Photo A**, and make a single pass. Reposition the fence to align the bit with the next mark. After making a single pass on one side of the center groove, flip the workpiece 180° and make another pass an equal distance from the center on the other side. Reset your fence and continue this routine until you reach your final mark.

Complete the lids for all of the boxes by routing a 13⁄16" rabbet 3⁄8" deep along the bottom edges, allowing the lid to snugly fit the inside dimensions of the box.

To finish the grooves, sand them using 80- through 180-grit paper with your fingertips or a dowel of the corresponding diameter. Preserve the flat tops to the peaks, as shown *below right*, or round them off by sanding them with abrasives backed by a soft pad to yield the look shown *top right*.

To complement this or Texture 2 on the next page, scallop the box sides using either a drill press-mounted sanding drum, as shown in **Photo B**, or an oscillating spindle sander. This texturing approach offers less spacing and cutting depth precision than a router table, so consider this more of a free-hand shaping technique.

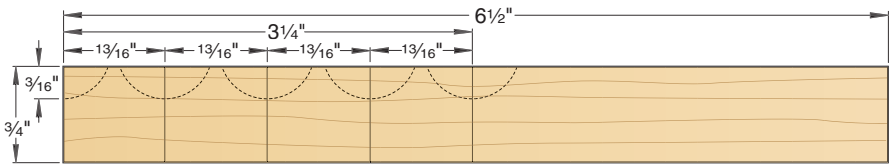
B

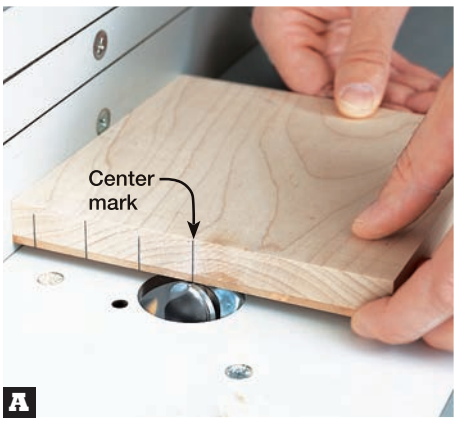
A wavy surface created on the box sides complements the top's rounded ridges.

Try your own textures

If these ideas get your creative juices flowing, share your texturing techniques with us. Send us photos of your textured wood with an explanation of how it was done. If we feature your idea in *WOOD*® magazine, we'll send you $100. Mail ideas to *WOOD* magazine, 1716 Locust-GA310, Des Moines, IA 50309-3023.

1 GROOVED PATTERN LAYOUT





A

Center the tip of the round-nose bit beneath each evenly spaced mark indicating the center of a groove. This maple workpiece includes a 1⁄8" layer of cherry for contrast.

Texture 1: Wavy lid with flat-top ridges

Texture 2: Cherry-on-maple top with grid pattern

C Making the grid pattern is as simple as rotating the workpiece three times for each off-center pass.

Texture 2: from grooves to grids

A variation on the grooved pattern adds two extra steps to the routine. After making the center groove with the grain, rotate the workpiece 90° and cut another center groove across the grain.

Move the fence to make your first off-center grooves the same as for the earlier lid. Follow up that first cut by rotating the workpiece 90° three times for three subsequent cuts, as shown in **Photo C**. Reset the fence for the next mark and make another four passes, repeating this process until you reach the edges.

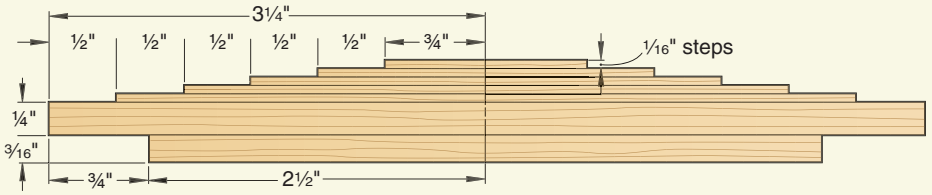
Texture 3: sawing stepped designs

Cut this stepped pattern on a tablesaw using a general-purpose (40- or 50-tooth) blade with a ⅛" kerf and the layout shown in **Drawing 2**. For added safety and stability, clamp the workpiece to a length of scrap that's as wide as the dimensions of the square you're cutting, as shown in **Photo D**.

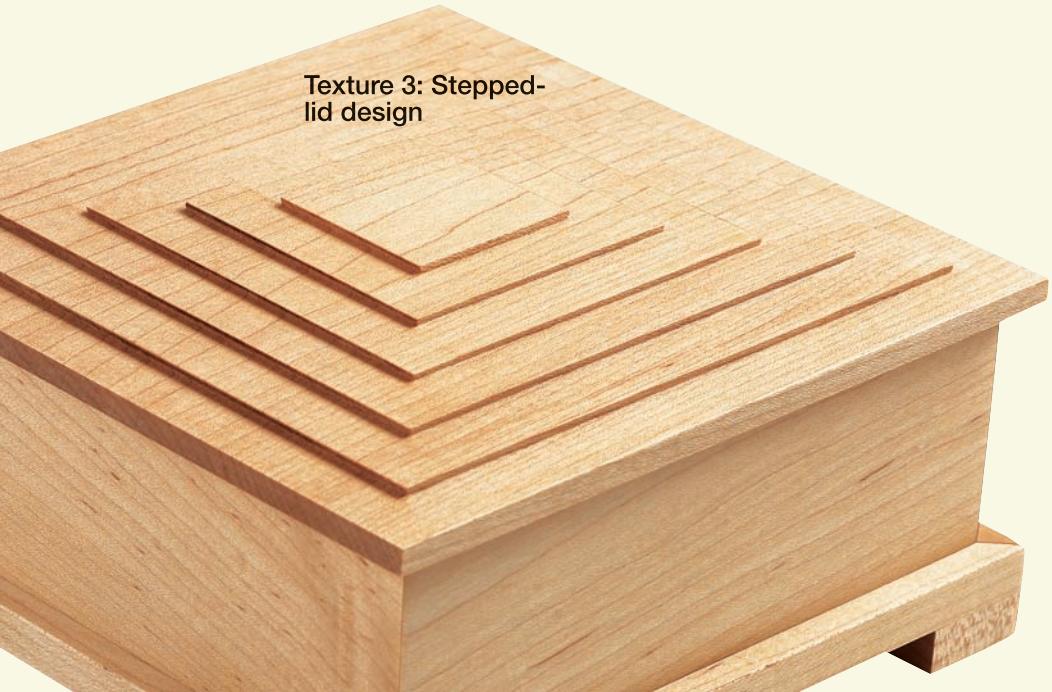
With each pass, we shaved off about 1/16". After five series of step cuts, enough thickness remained on the ¾"-thick stock to allow for a ¼"-thick final step with a ¾"-wide by 3/16"-deep rabbet on the underside.

Sand the steps using a piece of scrap with adhesive-backed sandpaper along one face to avoid rounding over the crisp edges shown *below*. Sand with the grain from 100 grit through 180 grit for a clear finish, or to 240 grit if you plan to use stain.

2 STEPPED-LID LAYOUT



For this 6½"-square lid, we left a 1½" square as the center high point and made each step ½" wide by 1/16" thick after sanding. For a snug fit, measure the inside dimensions of your box before cutting the 3/16" rabbet on the bottom that holds the lid in place.



Texture 3: Stepped-lid design

D To solve tear-out problems, cut passes against the grain before cutting the two with the grain. Use the clamp as a handle.

Texture 4: distinctive dimples

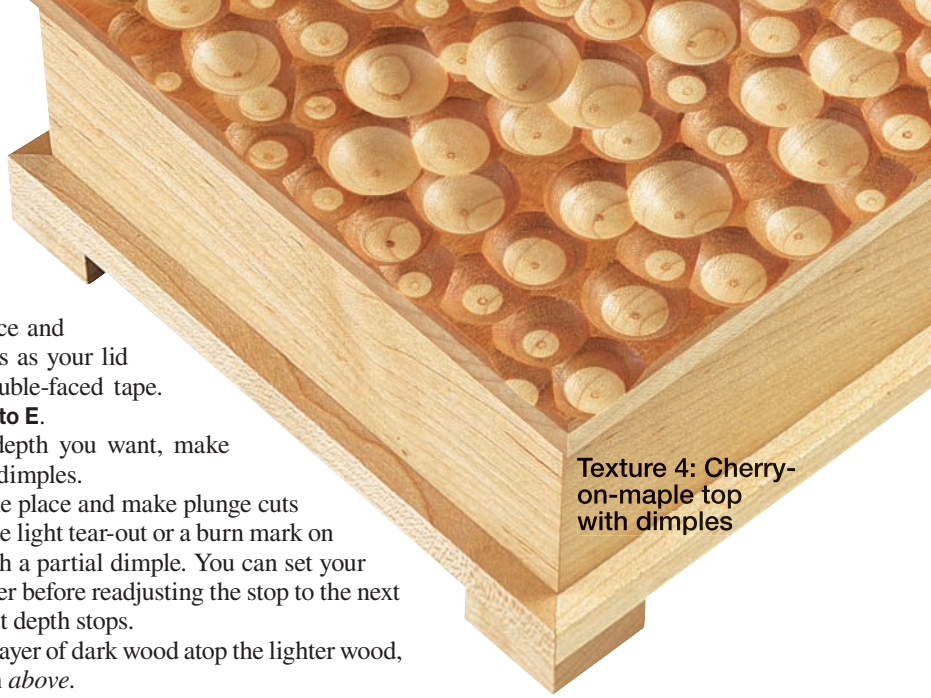
This asymmetrical pattern gives a project an informal, unstructured look where no two surfaces are alike Make the dimples using the same 1" roundnose bit used to cut the grooves, or vary the bit sizes and cutting depths for more contrast.

First, build a temporary frame to hold your lid in place and prevent tear-out. Cut the frame strips the same thickness as your lid and attach the frame to a hardboard backing using double-faced tape. Clamp the assembly to your workbench, as shown in **Photo E**.

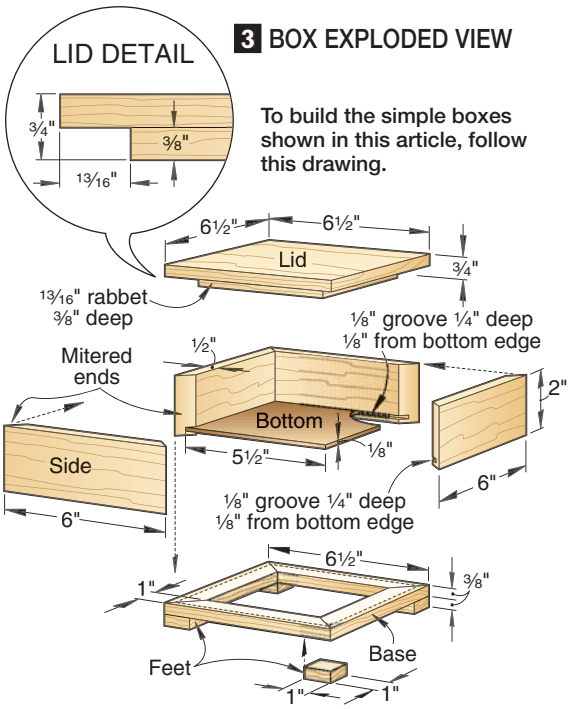
After setting your plunge router for the maximum depth you want, make practice cuts on scrap to produce clean, round, burn-free dimples.

To begin dimpling the workpiece, hold the router in one place and make plunge cuts of varying depths until the surface is covered. If you notice light tear-out or a burn mark on one of your cuts, it's possible to cover up the damage with a partial dimple. You can set your router turret stops to cut dimples of one depth and diameter before readjusting the stop to the next depth. With practice, you can also cut the dimples without depth stops.

To make the dimple pattern more dramatic, laminate a layer of dark wood atop the lighter wood, as we did with this maple and cherry combination, shown *above*.



Texture 4: Cherry-on-maple top with dimples



A variation on dimpling the entire surface is to confine dimples to a path from one edge of the lid to another, as shown *above*. Or add a frame to make a dimpled top stand out, as shown *below*.

E

A frame supports the router base and eliminates tear-out while cutting dimples on the edge of the workpiece.

Still more texturing ideas

Experimenting on scrap can lead you to a host of other texturing techniques and looks. These include:

- **Score the surface with shallow, closely spaced grooves.** Use a woodcarver's V-shape parting tool to create this handcrafted look, shown *right*. Staining the surface adds extra contrast to the grooves.
- **Uniformly roughen the surface** for a rough-sawn rustic look. Using a bandsaw, draw your workpiece from the back to the front along the edge of the blade, as shown *right*, allowing the wood to skim along the teeth of the blade. Move the workpiece across the blade at a quick and steady pace to avoid leaving heavily gouged lines or removing too much stock.

Better Homes and Gardens®
WOOD® PATTERNS®
April/May 2005 Issue 162

Dear Reader: As a service to you, we've included full-size patterns on this insert for irregular shaped and intricate project parts. You can machine all other project parts using the Materials List and the drawings accompanying the project you're building.

Frame Jig, Page 20
Chamfer Plane, Page 47
Outdoor Bench, Page 82
Lumber Rack, Page 92

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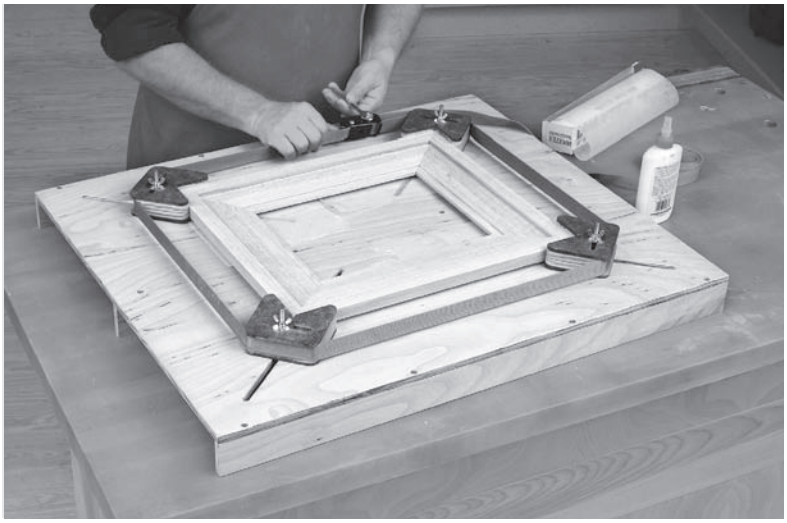
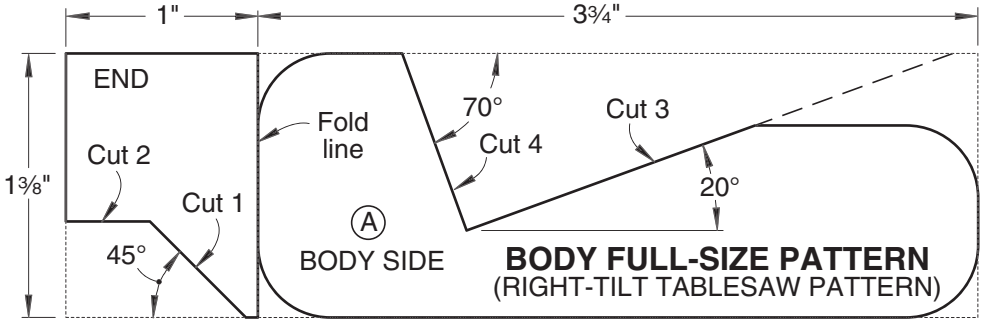


Frame Jig, Page 20

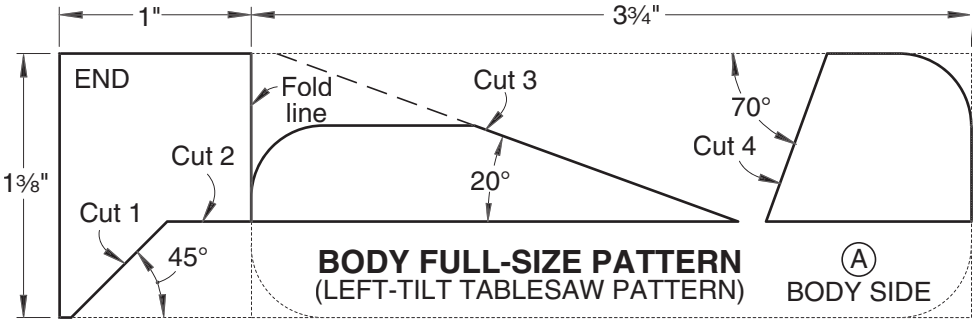
Chamfer Plane, Page 47

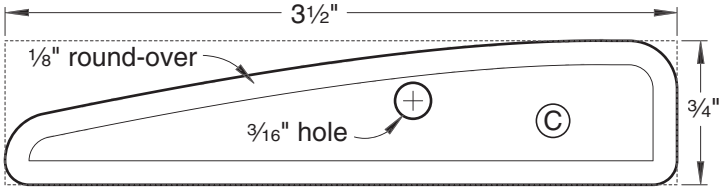
Outdoor Bench, Page 82

Lumber Rack, Page 92

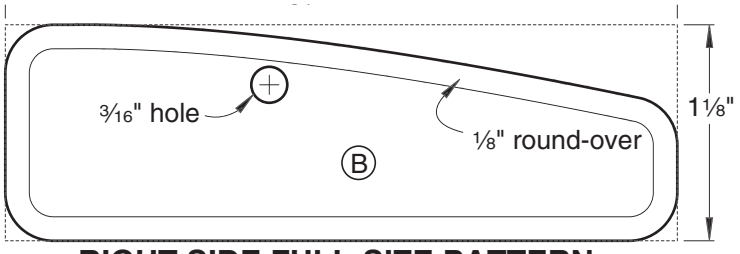


Chamfer Plane, Page 47

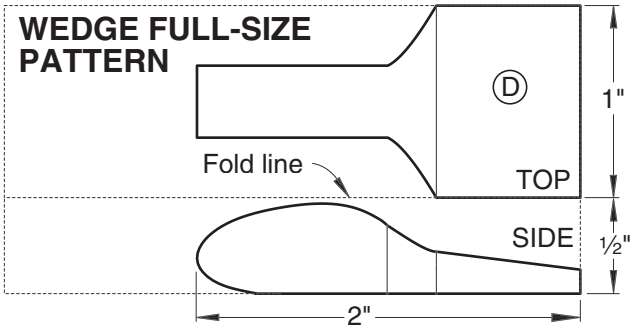




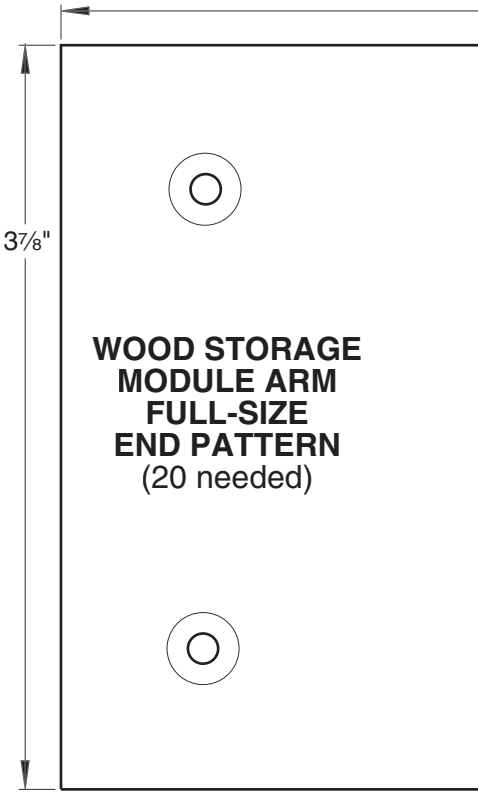
LEFT SIDE FULL-SIZE PATTERN



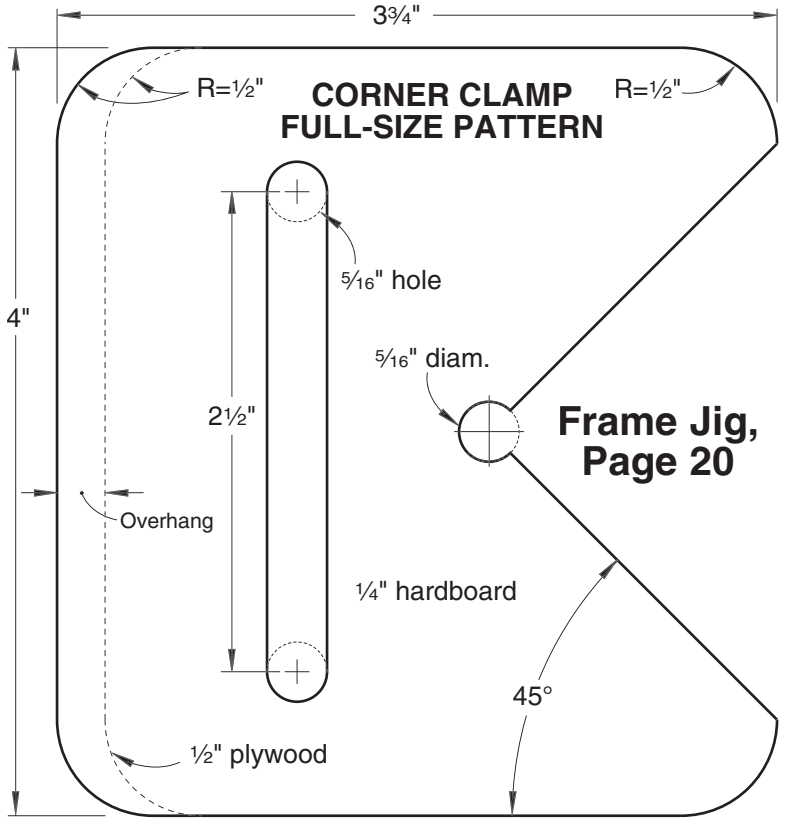
RIGHT SIDE FULL-SIZE PATTERN



Lumber Rack, Page 92

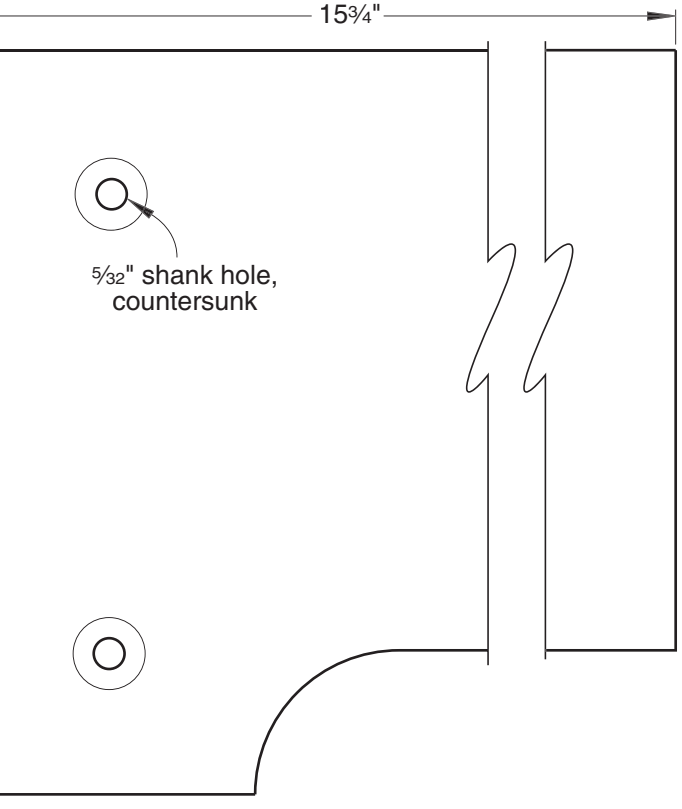


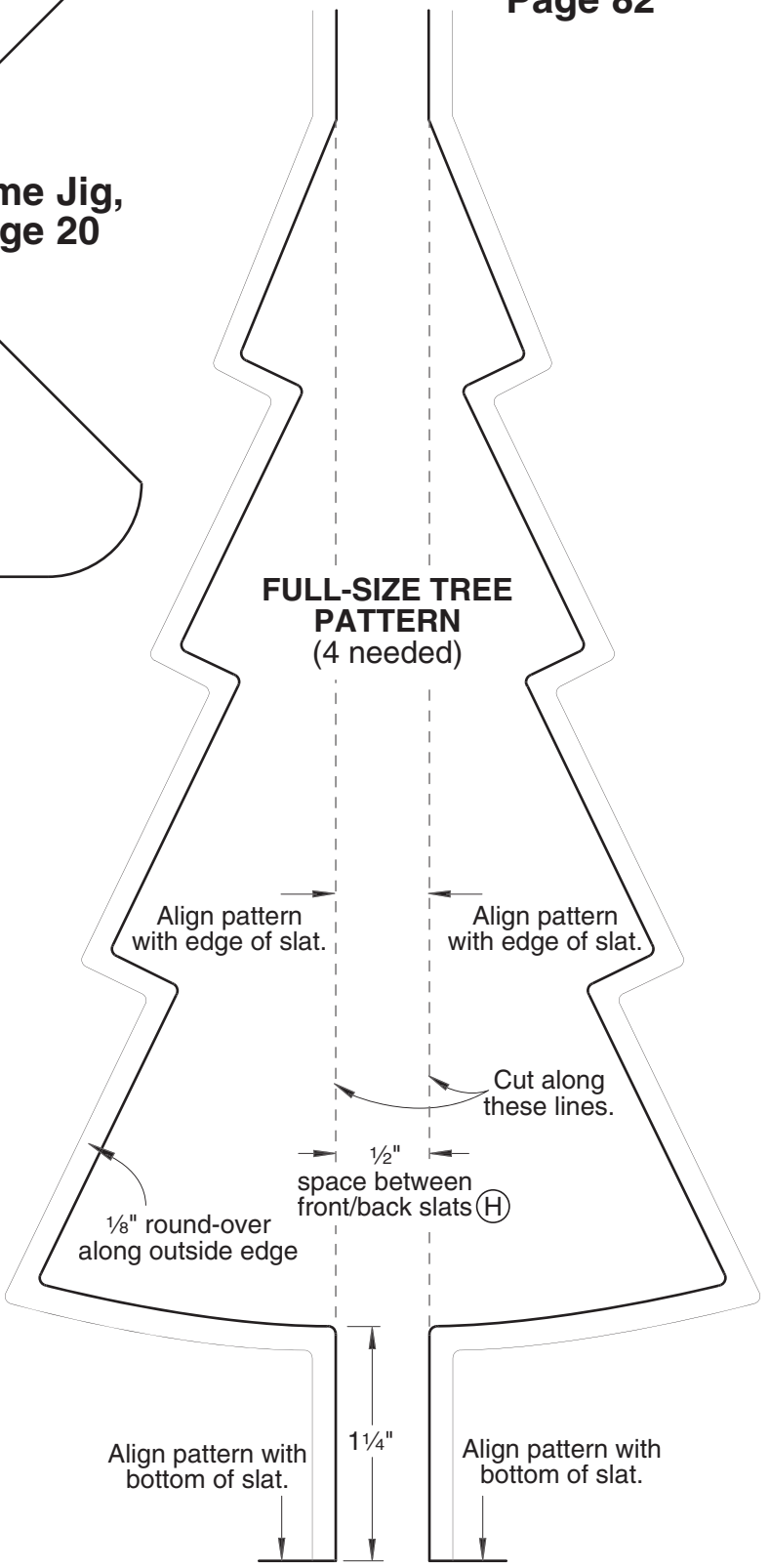
WOOD STORAGE MODULE ARM FULL-SIZE END PATTERN
(20 needed)



Frame Jig, Page 20

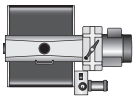
Outdoor Bench, Page 82

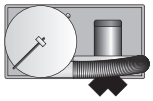


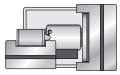

FULL-SIZE TREE PATTERN
(4 needed)
Align pattern with edge of slat.
Align pattern with edge of slat.
Cut along these lines.
½" space between front/back slats (H)
⅛" round-over along outside edge
Align pattern with bottom of slat.
1¼"
Align pattern with bottom of slat.

WORKSHOP LAYOUT, PAGE 36

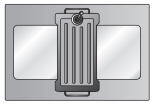
16" Scrollsaw


16" Drum sander

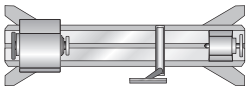

1,100 CFM dust collector


6" Belt, 12" Disc sander

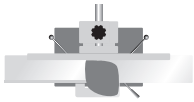
Router/shaper 24x30" table


12" Portable planer on stand

16½" Drill Press


14" Lathe

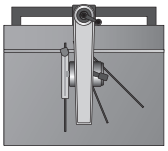
Oscillating spindle sander


6" Jointer

20-gallon vertical air compressor

10" Mitersaw

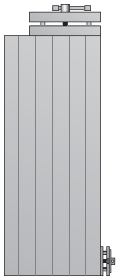
14" Bandsaw

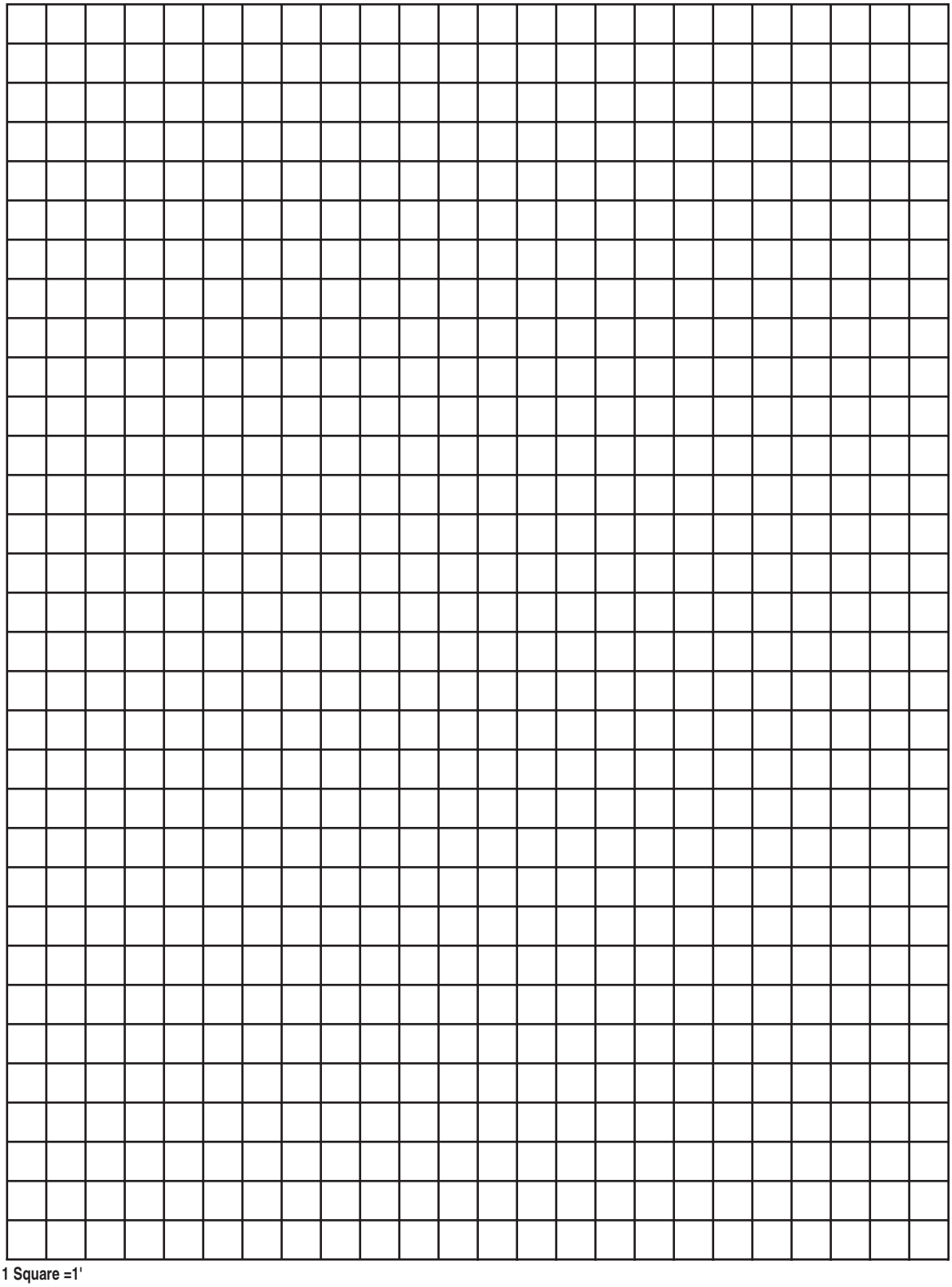

Radial-arm saw

10" Tablesaw with 30" fence

4x8' Plywood sheet

6x96" Board


24x60" Workbench


1 Square =1'

5 specialty clamps

That every woodworker should have!

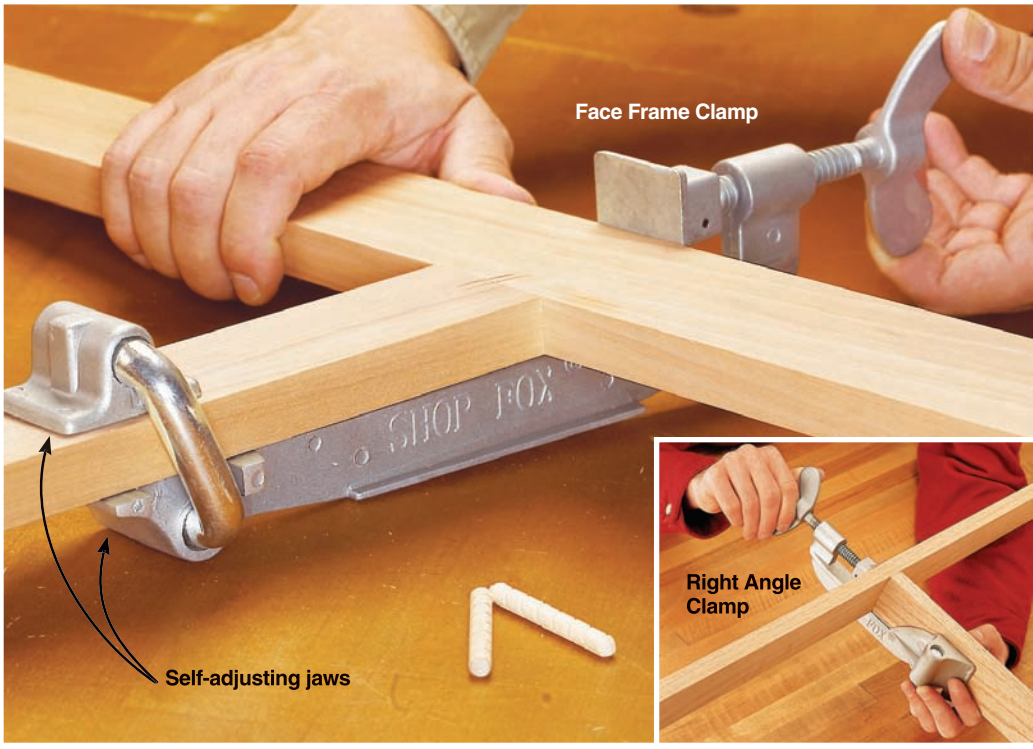
Have you ever tried to cobble together bar clamps and wood scraps to solve that one-of-a-kind clamping problem? Or worse yet, have you bought a special-purpose clamp thinking it would be handy, only to find it unused on a dusty shelf years later?

Who hasn't? To help you buy only the specialty clamps you'll truly need, we tried more than 30 types in the *WOOD*® magazine shop starting about a year ago, and gradually whittled the list down to these five must-have favorites.

1 Face Frame and Right Angle Clamps

Face Frame Clamps don't care how long a workpiece is; with them in your shop, you may never need those super-long pipe or bar clamps. Suited ideally for face-frame work, the clamp consists of abrasive-covered self-adjusting jaws that fit a workpiece up to ⅞" thick, and actually grip it better as you cinch up the large wing knob to draw the two pieces together. With this design you can glue and clamp one joint at a time, rather than rushing through an assembly before the glue sets up on the other end, as you often must do with cumbersome bar or pipe clamps. The Right Angle Clamp (*inset*) is identical to the Face Frame Clamp, except that it holds the workpieces on edge, rather than flat. That makes it a good choice for assembling drawers and boxes.

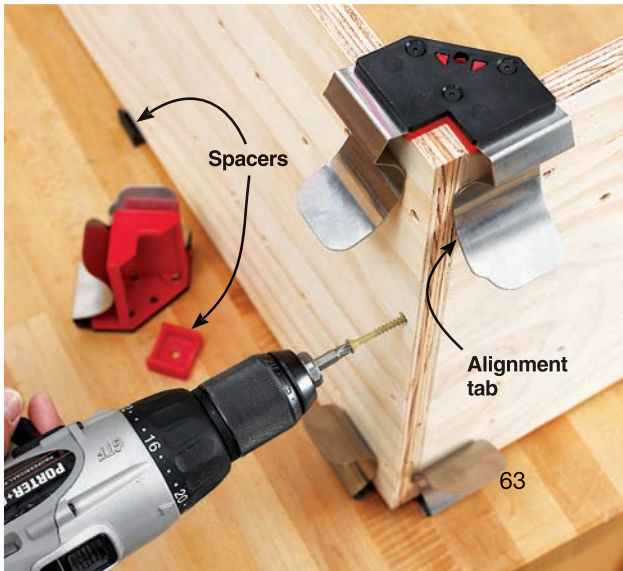
Shop Fox Face Frame (D2269) and Right Angle (D2268) Clamps, $15 each.
For more info: 800/840-8420, shopfox.biz



2 Jet Jointing Clamps

We wouldn't be without this extra pair of hands when it comes to assembling case goods, such as a bookcase or cabinet. The spring-steel jaws keep corners square, and the alignment tab on one jaw provides a surface to keep the mating pieces of the joint flush. (For T-joints, rotating the clamp 90° moves the tab out of the way.) These clamps are surprisingly strong—we sometimes had to sand out slight marring left by the jaws, but found that rounding over their edges with a file helped—and perfect for holding biscuit- or dowel-reinforced joints together until the glue dries. Sold in matched pairs (top and bottom, as shown in the photo), the Jointing Clamps also come with spacers to compensate for the thickness of the clamp base; we found those very handy in case construction.

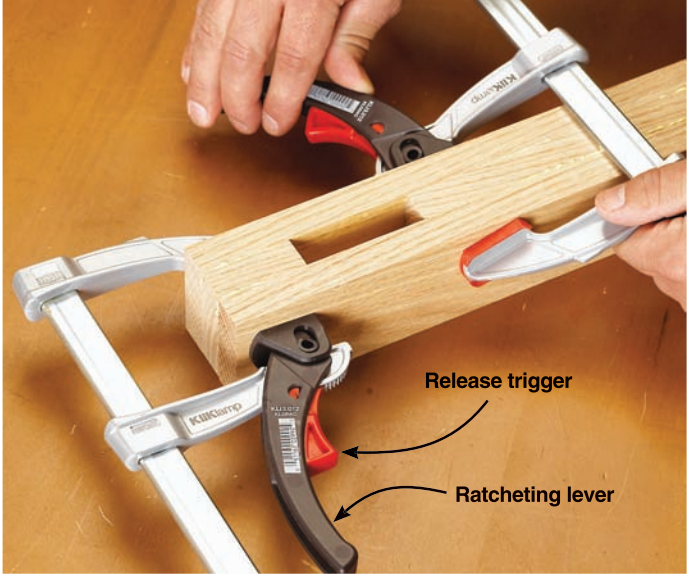
Jet Jointing Clamps (709055), $20/pair.
For more info: 800/274-6848, wmhtoolgroup.com



3 KliKlamps

They're just one-handed bar clamps, right? Well, yes and no. Lightweight yet powerful, the cam action of KliKlamps multiplies light hand pressure into 330 lbs of clamping pressure at the jaws, according to the manufacturer. And you can stop at nearly any point in between, too, thanks to a ratcheting pawl on the movable jaw that increases the clamping pressure one "click" at a time. Manually close the jaws on the joint and with a flick of the lever achieve full clamping pressure—no more cranking or hard squeezing like on a typical one-handed clamp. We also found the ratcheting feature virtually vibration-proof, making KliKlamps a great choice for temporarily securing benchtop tools, such as a portable planer or mitersaw, in place on a bench or portable workstation. They come in three capacities: 4", 8", and 12" (shown).

Bessey KliKlamps, $19–$22 each.
For more info: 800/265-8612, besseytools.com



4 Wolfcraft Retractable Band Clamp

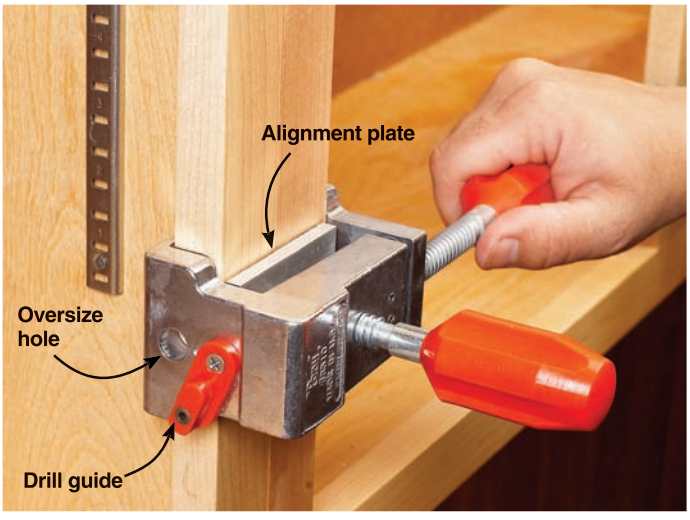
Although there's nothing new about band clamps (we find them indispensable for almost any project with mitered joints, such as a picture frame or octagonal column), this one does away with many of the nuisances of most band clamps. Pulling the small trigger automatically retracts the excess band into the body of the clamp. The large trigger acts like the lever on a one-handed bar clamp, leaving one hand free to make adjustments while cinching up the band.

Wolfcraft Retractable Band Clamp, $40.
For more info: 630/773-4777, wolfcraft.com

5 Cabinet Claws

Installing side-by-side face-frame cabinets tries even the most patient woodworker. You need to somehow keep the cabinets level and flush, then drill pilot holes and drive screws. Cabinet Claws have a floating alignment plate to keep the faces flush, and a pair of jaws to snug the frames together. To attach the cabinets to each other, drill your screw pilot hole using the pivoting drill guide, then rotate it aside and drive the screw through the oversize hole. (Cabinet Claws are sold in pairs to make the job easier.) If you install more than a few cabinets, these clamps will save you loads of frustration. They're also available for face-frameless European-style cabinets (model #8520).

Pony Cabinet Claws (#8500), $40/pair, including drill bit.
For more info: 312/666-0640, adjustableclamp.com



And two great accessories

Have you ever had to sand a dent out of a project because your hard metal clamp jaws marred the wood surface? Plastic jaw covers soften the blow, but can leave behind an oily residue that, again, you have to sand away. And some have a habit of slipping off the jaw. These cushioning leather clamping pads from Lee Valley Tools protect your projects from marring. The pierced pads fit most pipe and bar clamps; the leather discs work on deep-reach and F-style clamps—attach them with contact cement.

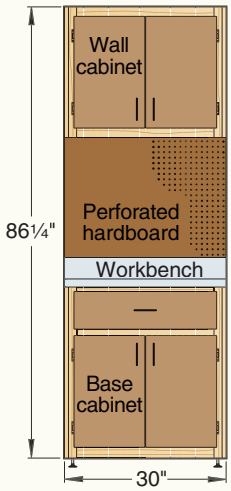
Leather Clamp Pads, $3.25 for two pierced pads (13F04.05) or six round pads (13F39.01). For more info: 800/871-8158, leevalley.com

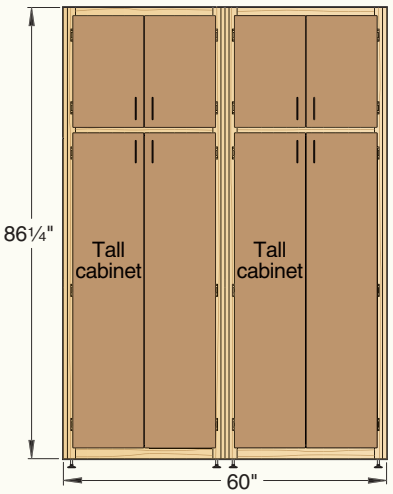
a versatile solution for your basement or garage

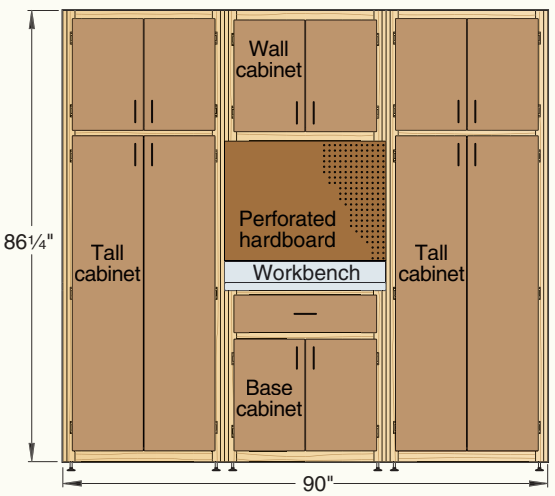
utility cabinet system

Not impressed with the particleboard utility cabinets available at your local home center? Neither were we. So we designed a sturdy, easy-to-build set of cabinets. Build one or more of the components to suit your clutter-control needs.

BUILD THE CABINET COMBINATION THAT FITS YOUR SPACE AND STORAGE NEEDS







If your garage or basement is the final pocket of disorganized resistance in your home, then assemble this SWAT team of storage solutions. Made of durable medium-density fiberboard (MDF), these cabinets feature rigid hardwood face frames and, for added hanging options, perforated-hardboard backs. Better yet, the system is chock full of features that'll help you speed through the construction:

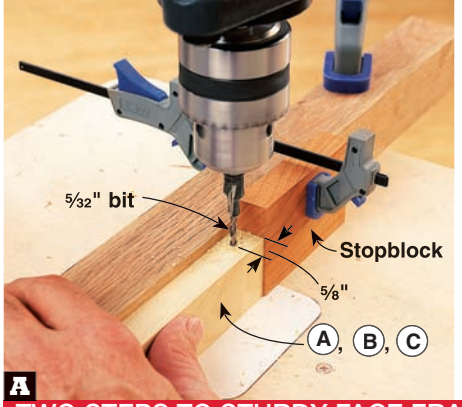
- Shop-made guides make drilling hardware mounting holes fast and accurate.
- Butt-joint construction makes for fast but sturdy joinery.
- Screw-together assembly allows you to prefinish all the parts with a paint roller.
- Special drawer side/slide hardware makes building the drawers a breeze.
- Self-closing hinges eliminate the need for door catches.

And when it's setup time, levelers accessible from *inside* the base and tall cabinets give you perfect no-hassle alignment.

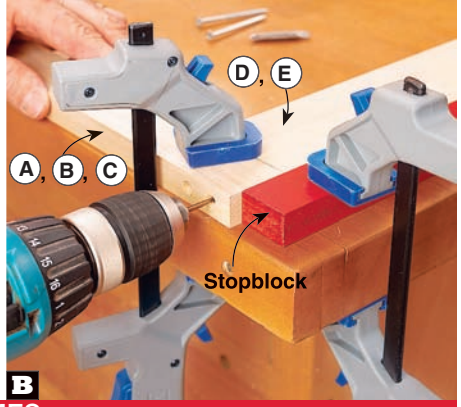
Plan your installation

1 Measure the length of wall in the area where you wish to set up your storage system. Make sure there is room for the 17¾" depth of the tall and base cabinets. Each wall/base cabinet pair and each tall cabinet require 30" of wall length. To find the total number of 30" modules you can fill with a combination of wall/base and tall cabinets, divide the total length of available wall in inches by 30, and round your answer *down* to the next whole number. For instance, if your wall measures 103", dividing 103" by 30" equals 3.43 modules. Rounding this down to a whole module gives you three 30" modules. The 90" cabinet arrangement, shown *opposite page, bottom right*, would fit in this space with 13" left over.

2 Make a sketch of the wall area, dividing it into the number of 30" modules determined in the previous step. Then sketch in the combination of wall/base and tall cabinets that fits your needs. Now count the number of each type of cabinet and generate a cutting list by filling in the blanks on the **Materials List** on *page 72*.



A



B

TWO STEPS TO STURDY FACE FRAMES

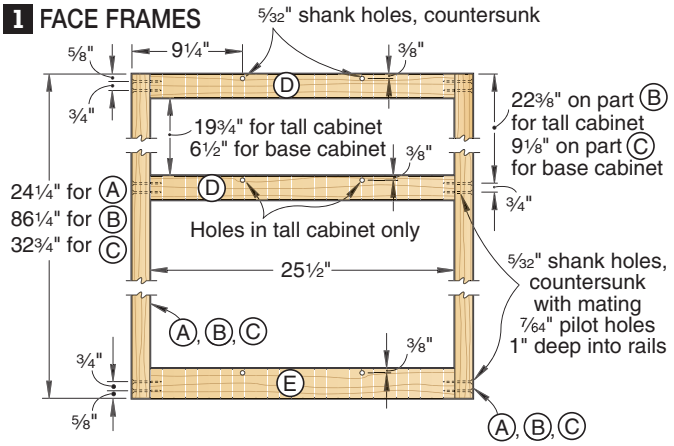
Position the stiles (A, B, C) with a stopblock, and drill countersunk screw holes 5/8" from the ends. Reposition the stopblock, and drill holes 1 3/8" from the ends.

Clamp a stile (A, B, C) and rail (D, E) to a flat surface, aligning them with a stopblock. Drill pilot holes into the rail, and drive the screws. Repeat for the other three corners.

Cut the case parts

1 From ¾"-thick poplar, cut the stiles (A, B, C), top and center rails (D), bottom rails (E), edging (F), and back rails (G) to the sizes listed on the **Materials List**. Mark the part letter on the end of each piece, and stack the parts in order.

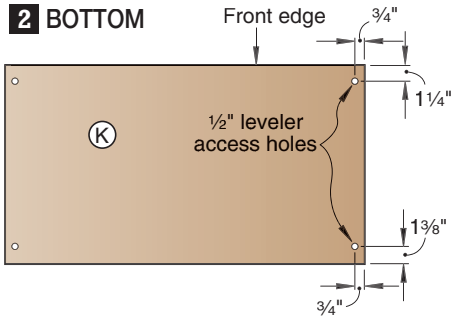
1 FACE FRAMES

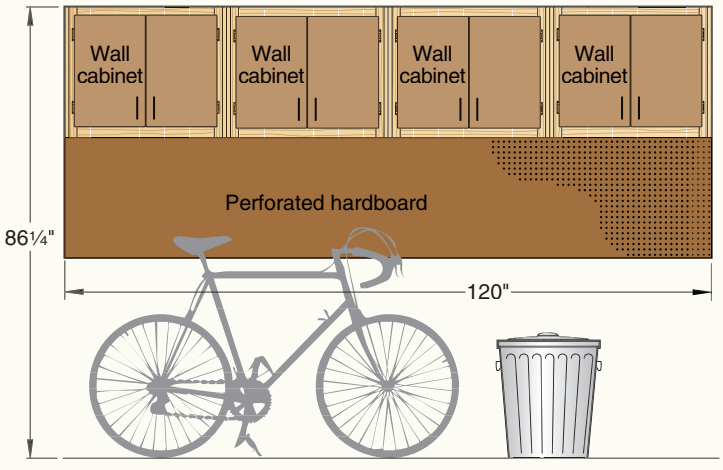


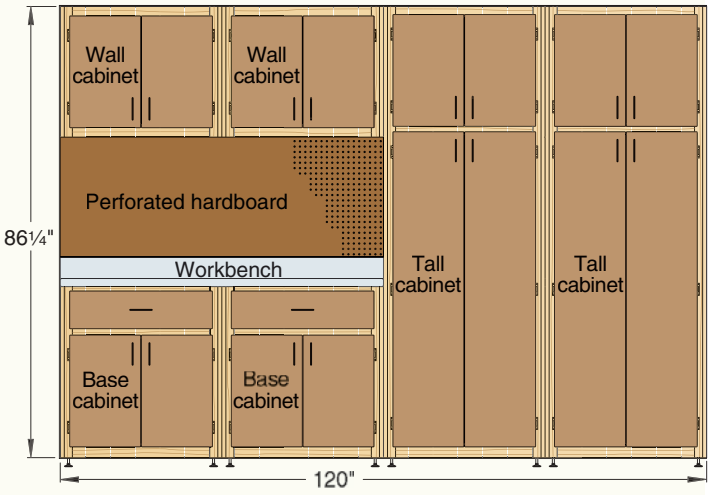
2 Referring to **Drawing 1**, drill countersunk 5/32" shank holes centered in the edges of the stiles (A, B, C) for fastening the top and bottom rails, as shown in **Photo A**. Then drill countersunk shank holes in the stiles (B, C) for fastening the center rails of the tall and base cabinets. Assemble the stiles and top and bottom rails, as shown in **Photo B**. Then add the center rails, where dimensioned.

3 Measure the exact sizes of the assembled face frames, and then from ¾" medium-density fiberboard (MDF), cut the sides (H, I, J), narrow tops and bottoms (K), and wide tops, bottoms, and fixed shelves (L) to size.

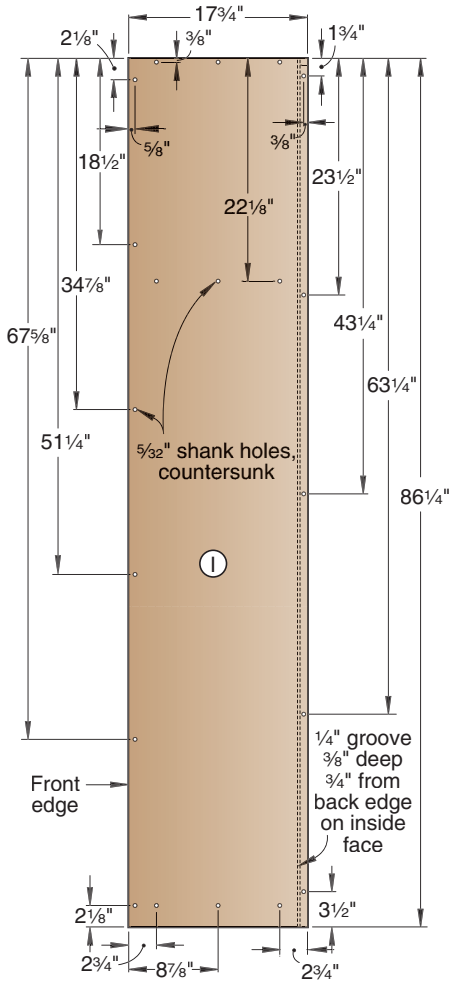
2 BOTTOM







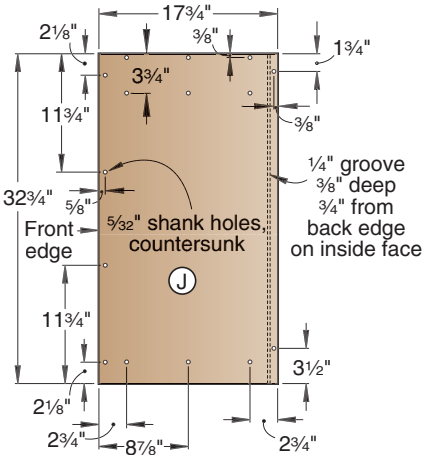
3 CASE SIDES



TALL CABINET SIDE

Make sure the sides are the same length as the mating stiles and the length of the tops, bottoms, and fixed shelves is equal to the overall width of the face frames. Then cut the adjustable shelves (M, N), doors (O, P), and drawer fronts (T) to size. Mark the part letter on the end of each piece, and stack the parts in order. For the length of the backsplash (X), add up the total width of the base cabinets in your storage system, and cut a piece of ¾" MDF to the width listed and the length determined.

4 Count the number of base and tall cabinets in your storage system. Designate this number of parts L as bottoms, and use a ½" Forstner bit to drill leveler access holes, where shown on **Drawing 2**.

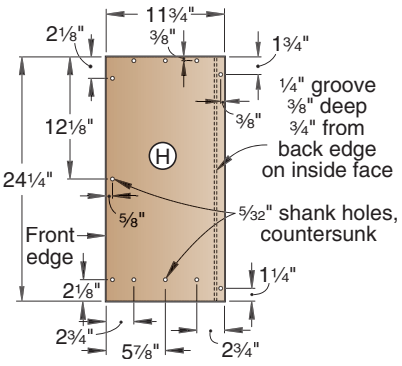


BASE CABINET SIDE

5 Measure the actual thickness of the perforated hardboard for the backs (Q, R, S), and cut ⅜"-deep grooves in the sides (H, I, J), where shown on **Drawing 3**.

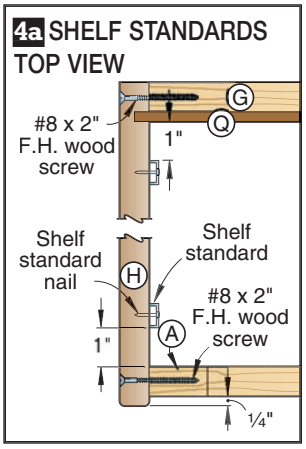
6 Glue and clamp the edging (F) to the adjustable shelves (M, N), where shown on **Drawings 4**, **5**, and **6**. With the glue dry, sand the edging flush with the shelves. Then sand any saw marks from the edges of all the MDF parts. Now rout ⅛" round-overs along the front edges of the edging, the front edges of the sides (H, I, J) and all edges of the doors (O, P) and drawer fronts (T).

7 From ¼" perforated hardboard, cut the backs (Q, R, S) to size. Cut the tool board face (Z) to width and to the same length as the backsplash (X).

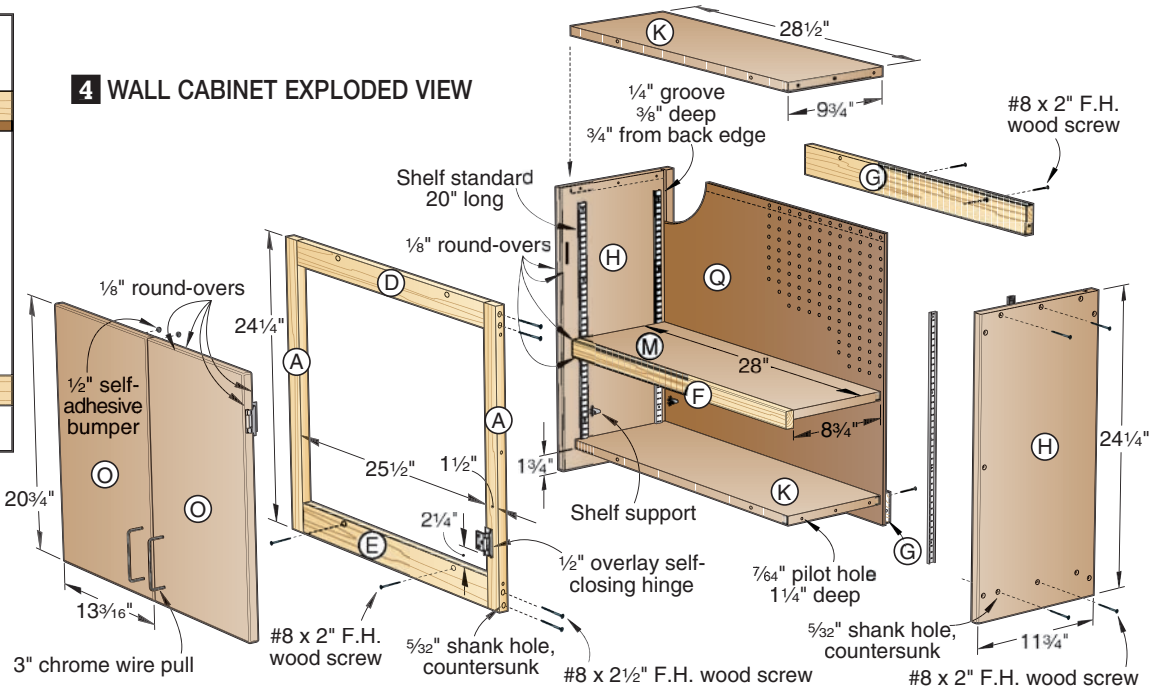


WALL CABINET SIDE

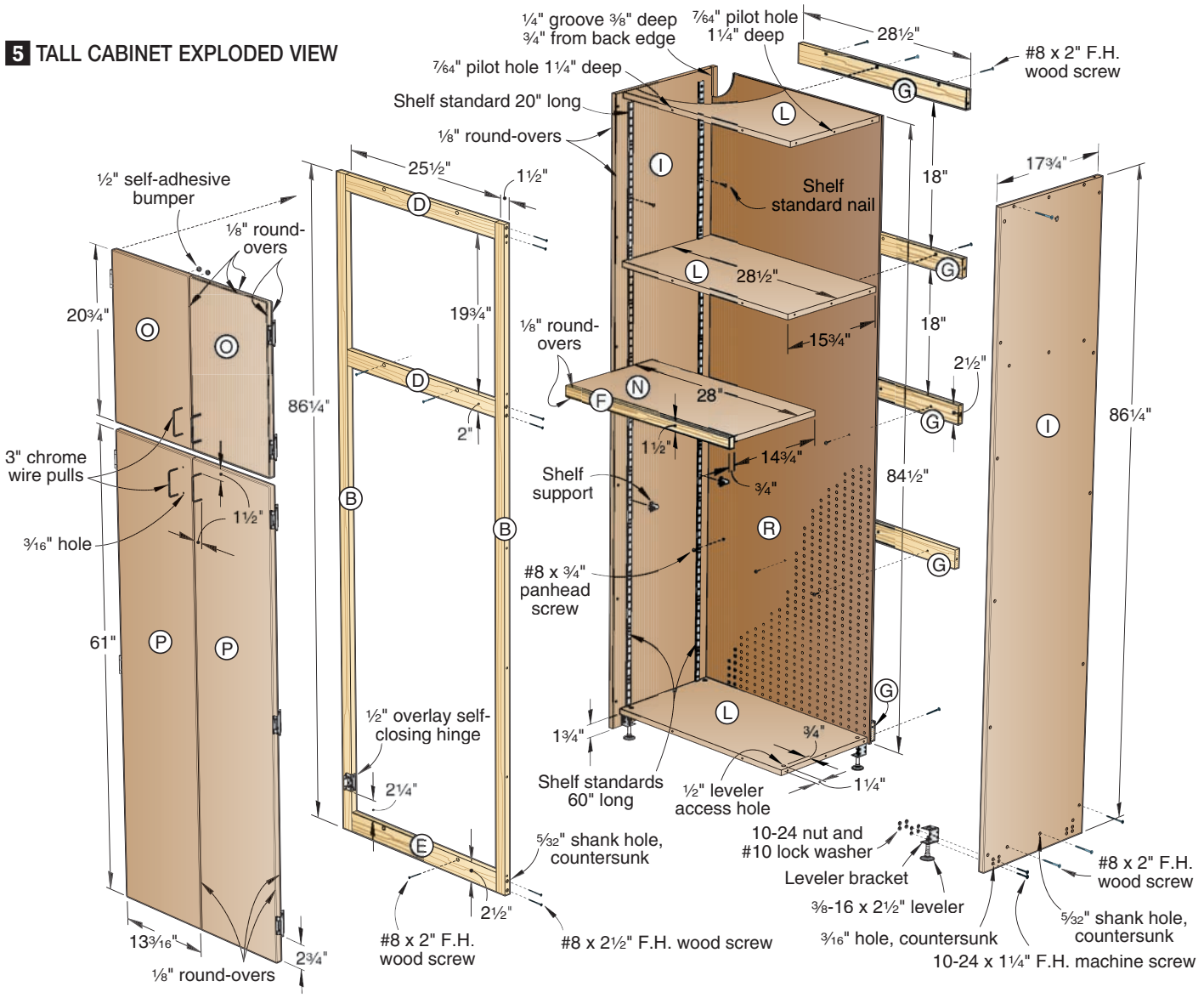
4a SHELF STANDARDS TOP VIEW



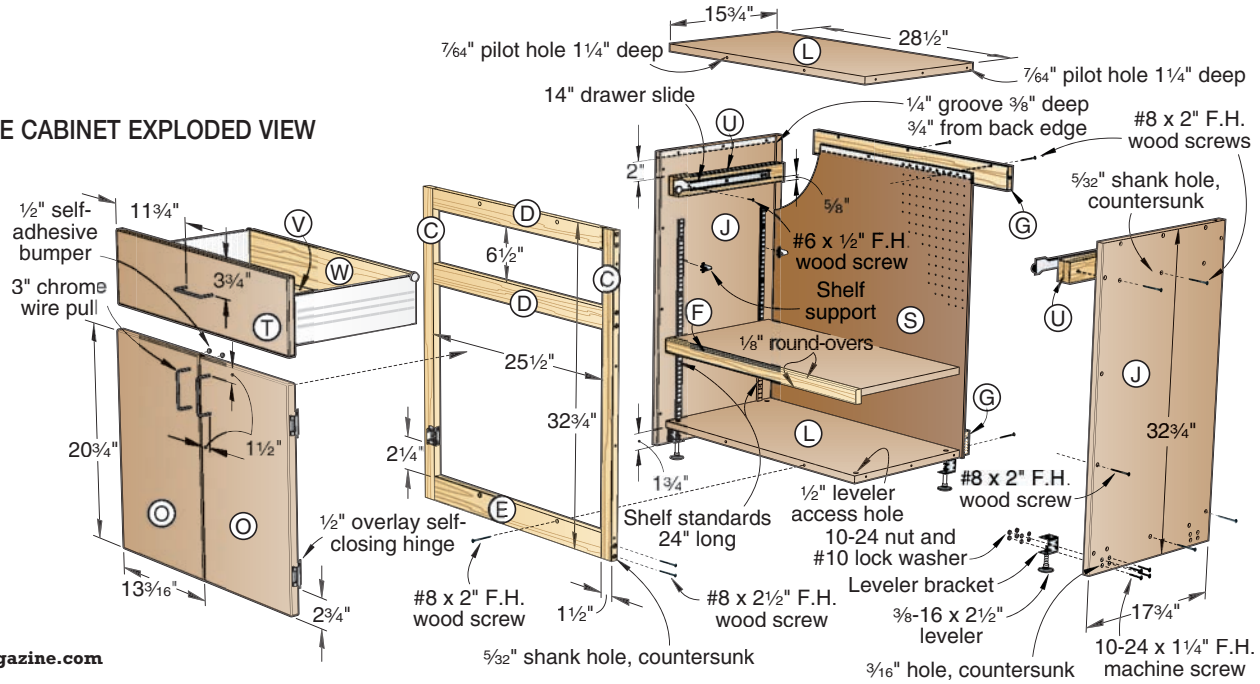
4 WALL CABINET EXPLODED VIEW



5 TALL CABINET EXPLODED VIEW

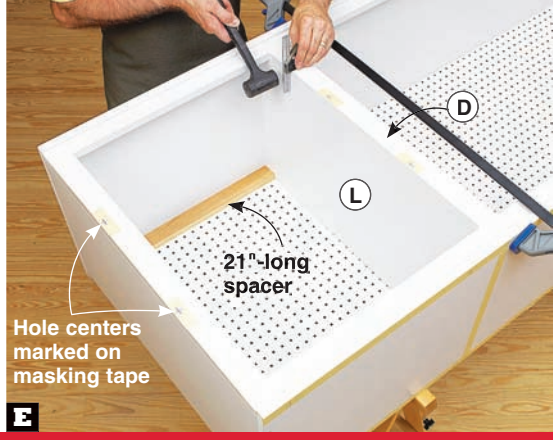


6 BASE CABINET EXPLODED VIEW



C

D



E

ASSEMBLY IS EASY AS CLAMP, DRILL, AND SCREW

With the back (Q) captured in the side (H) grooves, clamp the top (K) in place, flush with the tops of the sides, and the bottom (K) in place, 1¾" from the bottoms of the sides.

Align the top edges of the rails (D, E) with the top surfaces of the top and bottom (K). Drill countersunk screw holes where marked on the sides and rails, and drive the screws.

Place a 21"-long spacer between the tall cabinet top and fixed shelf (L) at the back. Use a square to align the top surface of the shelf and top edge of the center rail (D).

Finish and assemble

1 To seal the edges of the MDF parts before painting, see the **Shop Tip**, *below*. Now prime and paint all the parts except the back rails (G). (We rolled on an exterior acrylic latex primer followed by two coats of exterior acrylic latex semigloss paint. A short-nap roller gives the surfaces a subtle flaw-hiding texture.)

2 Apply masking tape to the outside faces of the sides (H, I, J), and mark screw-hole locations, where dimensioned on **Drawing 3**. Make sure the sides are mirror images. Then apply masking tape to the face frame rails (D, E), and mark screw-hole locations, where shown on **Drawing 1**.

3 For a wall cabinet, assemble the back (Q), sides (H), and top and bottom (K), as shown in **Photo C**. Now add the face frame (A/D/E), as shown in **Photo D**. Assemble the base cabinet in the same manner. For the tall cabinet, insert and align the fixed shelf (L), as shown in **Photo E**. Then drill countersunk screw holes, where marked on the sides, and rails and drive the screws.

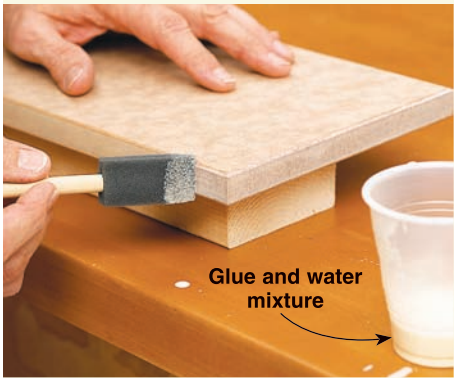
4 Turn the cabinets facedown, and position the back rails (G) where shown on **Drawings 4**, **5**, and **6**. Drill countersunk screw holes through the sides and into the rails, and drive the screws. Then on all the cabinets, drill countersunk screw holes through the back rails and into the tops and bottoms (K, L). On the tall cabinet, drill and screw the back rail to the fixed shelf (L). Then turn the cabinet over, and drill and screw the back (R) to the back rails.

5 To mount the levelers on the base and tall cabinets and the pulls on all the doors,

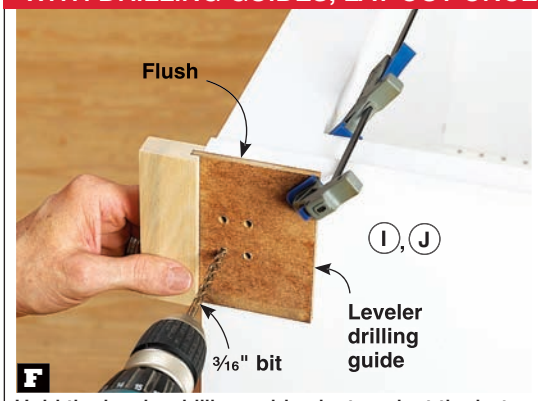
SHOP TIP

Seal MDF edges quickly and effectively

The raw edges of MDF parts will soak up many coats of primer before they are ready for a finish coat of paint. To avoid repeated primer applications, mix three parts woodworking glue with one part water and seal the edges, as shown *below*. When dry, sand the edges smooth with 220-grit sandpaper. Apply a single coat of primer, and you're ready for the finish coat.

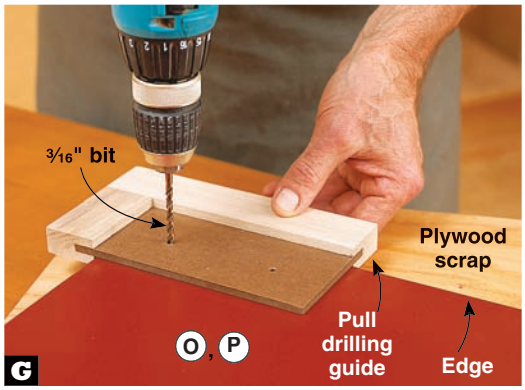


WITH DRILLING GUIDES, LAY OUT ONCE, DRILL MANY TIMES



F

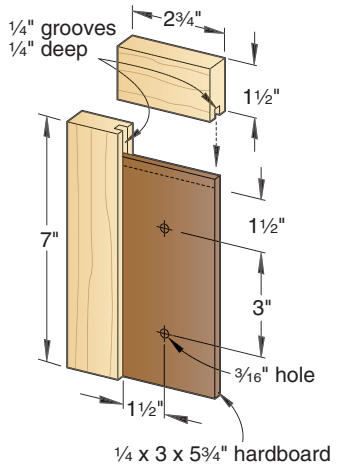
Hold the leveler drilling guide cleat against the bottom end of the side and align the guide edge with the side front edge. Drill the holes. Repeat at the rear and other side.



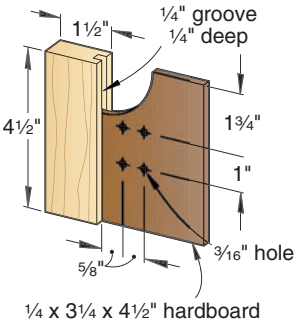
G

With a plywood scrap underneath the door to prevent chipout, position the drilling guide with the short cleat against the end of the door and the long cleat against the edge, and drill the holes.

7 DRILL GUIDES



PULL GUIDE



LEVELER GUIDE

SPACERS POSITION STANDARDS

Insert 1"-wide spacers between the shelf standards and the stile (A) and back (Q). With the ends of the standards against the bottom (K), nail the standards in place.

CAREFUL HINGE PLACEMENT NOW EASES DOOR HANGING LATER

Tape a 2¼"-long spacer to the stile with one end against the top, center, or bottom rail. Hold the hinge against the spacer, and drill pilot holes, centered in the hinge slots.

Set your combination square to 2¾". Holding the square against the top and bottom edges of the door, and the hinges against the guide, drill pilot holes, and drive the screws.

make the drilling guides shown on **Drawing 7**. Then drill holes in the cabinet sides, as shown in **Photo F**. Countersink the holes on the outside faces. Drill holes in the doors, as shown in **Photo G**. (Drill the holes at any corner. They will be properly oriented when installing the hinges.) Fasten the levelers to the cases with #10-24×1¼" flathead machine screws, lock washers, and nuts. Do not install the pulls at this time.

6 For the wall cabinet, trim the top ends of four 24"-long shelf standards to 20". Referring to **Drawing 4a**, fasten the standards to the sides (H) with special shelf standard nails, as shown in **Photo H**. For the base cabinet install 24" standards. For the tall cabinet, install 60" standards in the lower compartment and trim 24" standards to 20" for the upper compartment.

7 Position the top and bottom hinges for each door on the stiles (A, B, C) and drill pilot holes, as shown in **Photo I**. Position the top and bottom hinges on the doors with the previously drilled pull holes at the bottoms of the wall cabinet and tall cabinet short doors (O) and the tops of the base cabinet short doors (O) and tall cabinet long doors (P). Now mount the hinges, as shown in **Photo J**. Then on each long door, center a third hinge, drill pilot holes, and screw them in place.

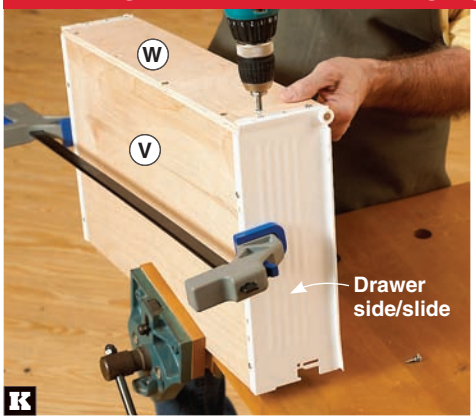
Make base cabinet drawers

1 Laminate two pieces of ¾-thick stock, and cut the cleats (U) to size. Place a 2"-wide spacer between the base cabinet top (L) and the cleat, and clamp the cleat in place. Drill countersunk screw holes through the side (J) and into the cleat. Then drive the screws.

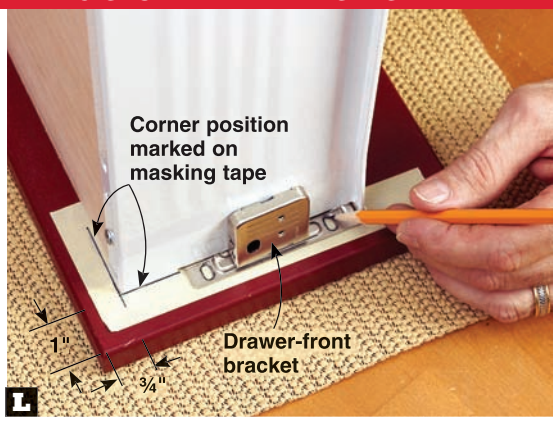
2 From ½" plywood, cut the drawer bottom (V) and back (W) to size. Clamp the back to the bottom, where shown on **Drawing 8**; drill countersunk screw holes through the back and into the bottom; and drive the screws. Mount the drawer side/slides to the bottom/back assembly, as shown in **Photo K**.

3 Snap the right- and left-hand drawer-front brackets onto the side/slides. Apply masking tape to the front (T) and mark the bottom front corner locations of the drawer box on the tape, where shown on **Drawing 8**. Mark bracket mounting-screw locations, as shown in **Photo L**. Remove the drawer box, drill pilot holes, and remove the tape. Reposition the drawer box, and drive the screws.

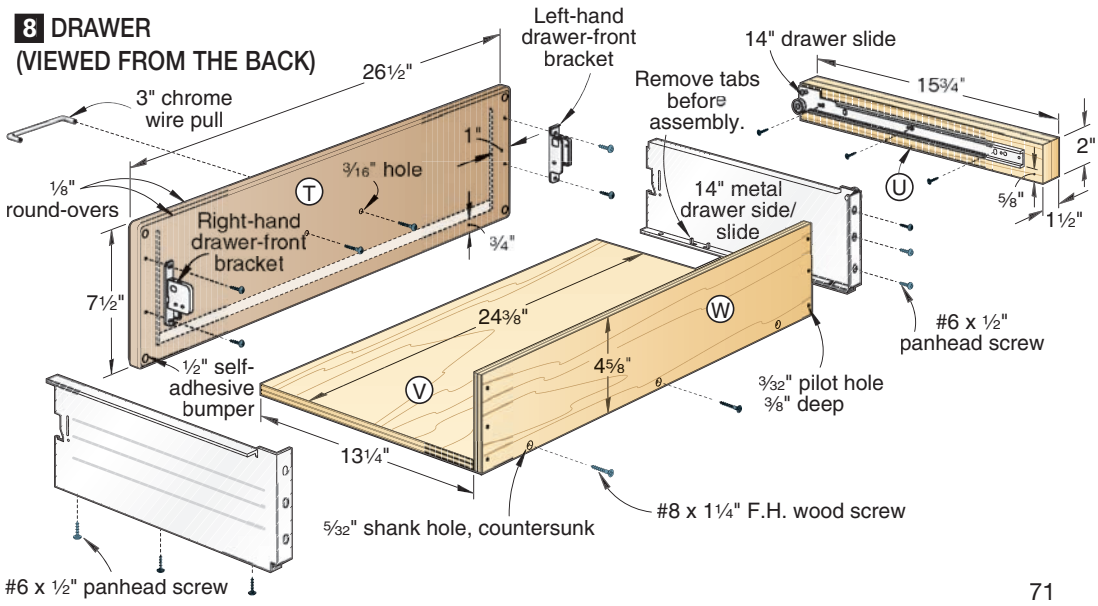
INEXPENSIVE HARDWARE MAKES BUILDING STURDY DRAWERS A SNAP



Hold the bottom/back assembly (V/W) in your vise. Remove the optional alignment tabs from the drawer side/slides, and clamp them in place. Drill pilot holes, and drive the screws.



With the locations of the bottom front corners of the drawer box marked on masking tape, align the drawer box assembly with the marks, and mark the bracket-hole locations.



How to complete the Materials List.
Step 1 Working off your planning sketch, count the number of each wall, tall, and base cabinet. Enter the numbers in all the open white boxes in the *vertical columns* marked Column 1 under the appropriate case.
Step 2 Add the numbers in each *horizontal row* and enter the sum in the open box in Column 2.
Step 3 Multiply the number in Column 2 by the number in Column 3 and enter the result in Column 4. This is the number of each part needed. For the total number of top and center rails (D); shelf edging (F); back rails (G); wide tops, bottoms, and fixed shelves (L); and wide shelves (N), add the numbers in the two rows of Column 4 and enter the sum in Column 4a.

Materials List

		FINISHED SIZE				Column	1			2		3		4	4a
Cases		T	W	L	Matl.		Wall cabinet	Tall cabinet	Base cabinet	Total cabinets using this part	Multiply	Number of parts per cabinet	Equals	Total parts	Total parts
A	wall stiles	¾"	1½"	24¼"	P			■	■		×	2	=		■
B	tall stiles	¾"	1½"	86¼"	P	■		■		×	2	=		■
C	base stiles	¾"	1½"	32¾"	P	■	■			×	2	=		■
D	top rails	¾"	2"	25½"	P					×	1	=		
D	center rails	¾"	2"	25½"	P	■				×	1	=		
E	bottom rails	¾"	2½"	25½"	P					×	1	=		■
F	shelf edging	¾"	1½"	28"	P		■			×	1	=		
F	shelf edging	¾"	1½"	28"	P	■		■		×	3	=		
G	back rails	¾"	2½"	28½"	P		■			×	2	=		
G	back rails	¾"	2½"	28½"	P	■		■		×	5	=		
H	wall sides	¾"	11¾"	24¼"	MDF		■	■		×	2	=		■
I	tall sides	¾"	17¾"	86¼"	MDF	■		■		×	2	=		■
J	base sides	¾"	17¾"	32¾"	MDF	■	■			×	2	=		■
K	narrow tops and bottoms	¾"	9¾"	28½"	MDF		■	■		×	2	=		■
L	wide tops and bottoms	¾"	15¾"	28½"	MDF	■				×	2	=		
L	wide fixed shelves	¾"	15¾"	28½"	MDF	■		■		×	1	=		
M	narrow shelves	¾"	8¾"	28"	MDF		■	■		×	1	=		■
N	wide shelves	¾"	14¾"	28"	MDF	■		■		×	3	=		
N	wide shelves	¾"	14¾"	28"	MDF	■	■			×	1	=		
O	short doors	¾"	13 3/16"	20¾"	MDF					×	2	=		■
P	long doors	¾"	13 3/16"	61"	MDF	■		■		×	2	=		■
Q	wall backs	¼"	29¼"	24¼"	PH		■	■		×	1	=		■
R	tall backs	¼"	29¼"	84½"	PH	■		■		×	1	=		■
S	base backs	¼"	29¼"	31"	PH	■	■			×	1	=		■
Drawer															
T	fronts	¾"	7½"	26½"	MDF	■	■			×	1	=		■
U	cleats	1½"	2"	15¾"	LP	■	■			×	2	=		■
V	bottoms	½"	13¼"	24⅜"	BP	■	■			×	1	=		■
W	backs	½"	4⅝"	24⅜"	BP	■	■			×	1	=		■
Workbench															
X	backsplash	¾"	5¼"	†	MDF	■	■	■	■	■	■	■	■	1	■
Y	top	1½"	17"	†	LMDF	■	■	■	■	■	■	■	■	1	■
Tool board						■	■	■	■	■	■	■	■	■	■
Z	face	¼"	24"	†	PH	■	■	■	■	■	■	■	■	1	■
AA	vertical spacers	¾"	1½"	21"	P	■	■	■	■	■	■	■	■	††	■
BB	horizontal spacers	¾"	1½"	†	P	■	■	■	■	■	■	■	■	2	■

† Dimension varies, see the instructions.
†† Number of parts varies, see the instructions.
Materials Key: P–poplar, MDF–medium-density fiberboard, PH–perforated hardboard, LP–laminated poplar, BP–birch plywood, LMDF–laminated medium-density fiberboard.

Supplies: #6x½" and #8x¾" panhead screws; #8x1¼", #8x1½", #8x2", and #8x2½" flathead wood screws; #10-24x1¼" flathead machine screws; #10-24 nuts; #10 lock washers.
Blades and bits: Stack dado set, ½" Forstner bit, ⅛" and ⅜" round-over router bits.

Add a top and tool board

1 To make the 1½"-thick top (Y), cut two pieces of ¾" MDF to the width listed and to match the length of the backsplash (X). Glue and screw the pieces together with the edges and ends flush. Sand the front edge smooth. Rout a ⅜" round-over along the top front edge and a ⅛" round-over along the bottom front edge, where shown on **Drawing 9**. Apply two coats of semi-gloss polyurethane to the front edge, sanding between coats with 220-grit sandpaper. Then apply two additional coats to the entire top, once again sanding between coats.

2 Clamp the backsplash (X) to the rear edge of the top, flush at the bottom and ends. Drill countersunk screw holes through the backsplash and into the top, where shown on **Drawing 9**. Drive the screws.

3 Cut vertical spacers (AA) for the ends of the face (Z), and then enough to space them 30" center-to-center in between. Cut the horizontal spacers (BB) to the same length as the face. Retrieve the face, and keeping the ends and edges flush, glue and clamp the spacers to the face, where shown on **Drawing 9**.

Source

Wall Cabinet: ½" self-adhesive bumpers no. 3MSJ5312, sheet of 56 (1); 3" chrome wire pulls no. A01966 26 (2); ½" overlay self-closing hinges no. A0755014 (2 pr.); 24" shelf standards no. KV0255ALU24 (4); shelf supports no. KV0256ALU, pack of 20 (1); shelf standard nails no. KV025581NZC pack of 50 (1). Order kit no. KIT01053, $20.94 ppd. Woodworker's Hardware. Call 800/383-0130, or go to wwhardware.com.
Tall cabinet: ½" self-adhesive bumpers no. 3MSJ5312, sheet of 56 (1); 3" chrome wire pulls no. A01966 26 (4); ⅜-16x2½" levelers no. LA38 212 (4); leveler brackets no. LA610Z (4); ½" overlay self-closing hinges no. A0755014 (5 pr.); 24" shelf standards no. KV0255ALU24 (4); 60" shelf standards no. KV0255ALU60 (4); shelf supports no. KV0256ALU, pack of 20 (1); shelf standard nails no. KV025581NZC, pack of 50 (2). Order kit no. KIT01051, $49.51 ppd. Woodworker's Hardware, see *above*.
Base Cabinet: ½" self-adhesive bumpers no. 3MSJ5312, sheet of 56 (1); 3" chrome wire pulls no. A01966 26 (3); ⅜-16x2½" levelers no. LA38 212 (4); leveler brackets no. LA610Z (4); ½" overlay self-closing hinges no. A0755014, (2 pr.); 24" shelf standards no. KV0255ALU24 (4); shelf supports no. KV0256ALU, pack of 20 (1); shelf standard nails no. KV025581NZC, pack of 50 (1); 14" drawer sides/slides no. B320K3500C15W (1 pr.); left-hand drawer front bracket no. BZSF.1200L (1); right-hand drawer front bracket no. BZSF.1200R (1). Order kit no. KIT01052, $46.85 ppd. Woodworker's Hardware, see *above*.
Total system: Enough of the hardware listed above to build two of each cabinet. Order kit no. KIT01054, $169 ppd. Woodworker's Hardware, see *above*.

Note: Shipping for quantities other than those given above will be calculated for the total cost of the hardware and in most cases will be less than the sum of the individual cabinet ppd. prices given.

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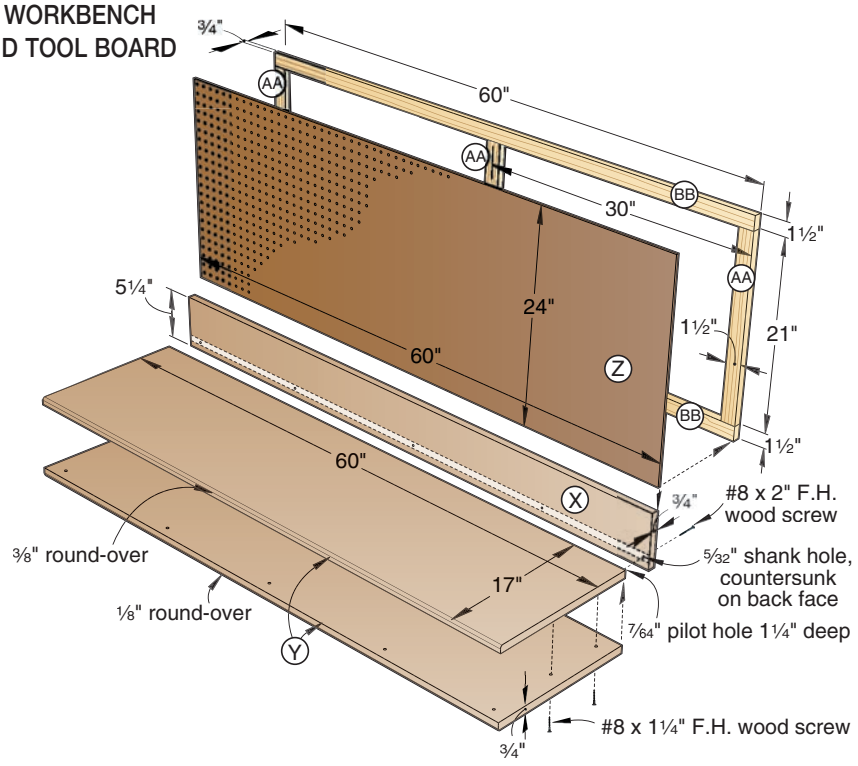
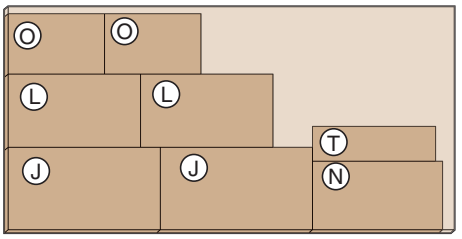
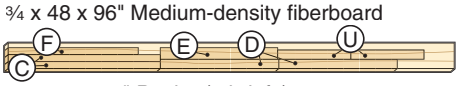
9 WORKBENCH AND TOOL BOARD



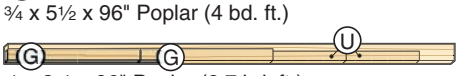
BASE CABINET CUTTING DIAGRAM



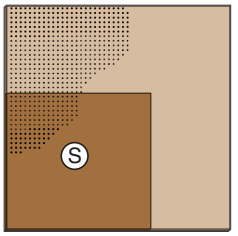
¾ x 48 x 96" Medium-density fiberboard



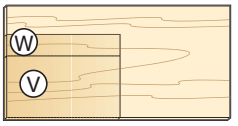
¾ x 5½ x 96" Poplar (4 bd. ft.)



¾ x 3½ x 96" Poplar (2.7 bd. ft.)

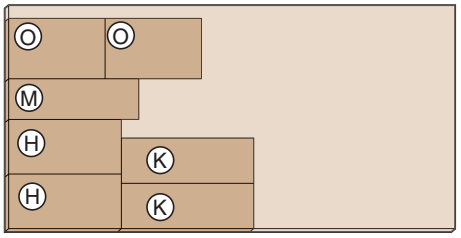


¼ x 48 x 48" Perforated hardboard

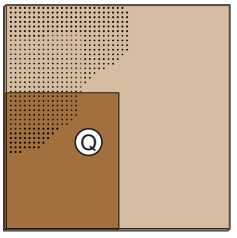


½ x 24 x 48" Birch plywood

WALL CABINET CUTTING DIAGRAM



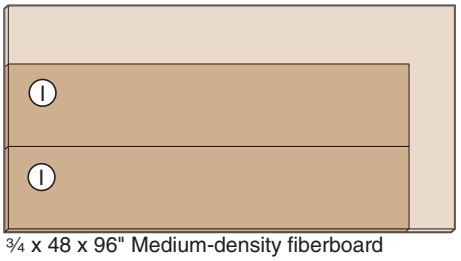
¾ x 48 x 96" Medium-density fiberboard



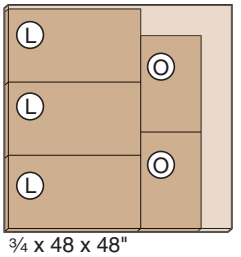
¼ x 48 x 48" Perforated hardboard

¾ x 5½ x 96" Poplar (4 bd. ft.)

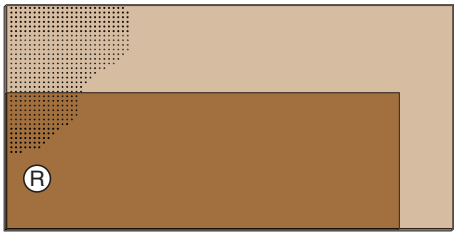
TALL CABINET CUTTING DIAGRAM



¾ x 48 x 96" Medium-density fiberboard

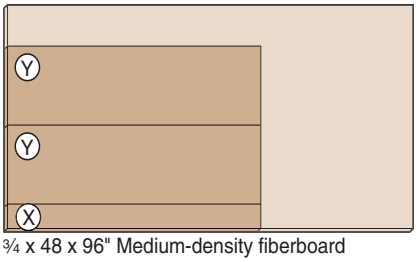


¾ x 48 x 48" Medium-density fiberboard

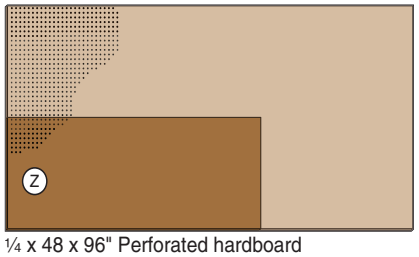


¼ x 48 x 96" Perforated hardboard

WORKBENCH AND TOOL BOARD CUTTING BIAGRAM



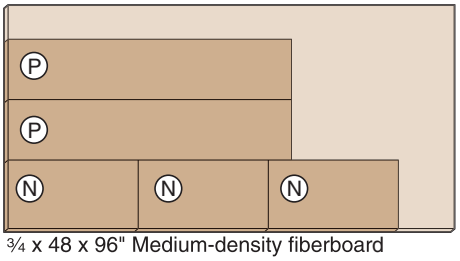
¾ x 48 x 96" Medium-density fiberboard



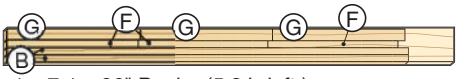
¼ x 48 x 96" Perforated hardboard

¾ x 5½ x 96" Poplar (4 bd. ft.)

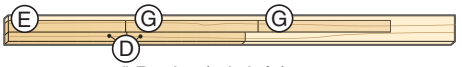
Note: The Cutting Diagrams shown represent the materials needed to build each cabinet individually. For more efficient use of material, use these diagrams as guides and make a combined diagram for all the cabinets you plan to build.



¾ x 48 x 96" Medium-density fiberboard



¾ x 7¼ x 96" Poplar (5.3 bd. ft.)



¾ x 5½ x 96" Poplar (4 bd. ft.)

Set up the system

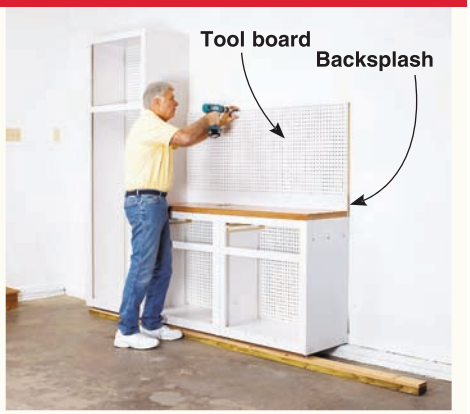
Many garages (like the one shown here) have a protruding concrete curb at the bottom of one or more walls. Tall and base cabinets sitting directly on the floor cannot be pushed tightly against the wall. For a solution to this problem, see the **Shop Tip**, *bottom*. The six steps, *below*, show how to set up the storage system shown on *page 66*. Use these instructions as a guide for setting up your own cabinet configuration. Now straighten out your garage, throw out the junk, and store the good stuff in your new cabinets.

Written by **Jan Svec** with **Chuck Hedlund**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine**

SET UP YOUR GARAGE STORAGE SYSTEM IN SIX EASY STEPS

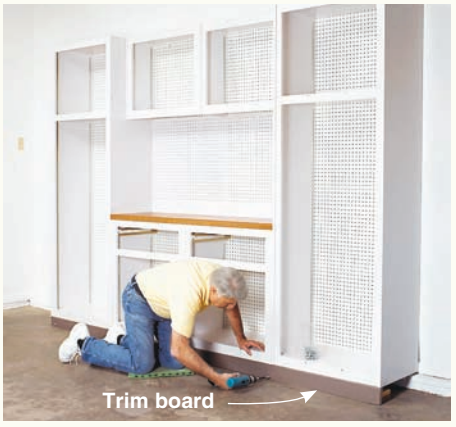
Step 1 Check the floor for level where you will place the cabinets. Position blocking under the front levelers. Start at the high end and level the first tall cabinet. Drill holes, and screw the cabinet to the wall studs.

Step 2 Add the base cabinets, aligning the bottoms and front edges with the tall cabinet. Screw them to the wall. Position the worktop, inserting ¼" shims behind it. Drill holes, and screw the worktop to the base cabinets.

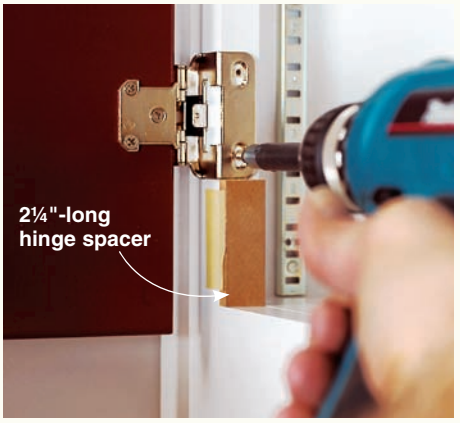


Step 3 Remove the shims, and rest the tool board on the top edge of the backsplash. Drill countersunk screw holes through the tool board and into the wall studs. Screw the tool board to the wall.

Step 4 Rest the first wall cabinet on the top edge of the toolboard tight against the tall cabinet. Drill holes through the cabinet back and drive the screws. Position the second cabinet, and screw it to the wall.



Step 5 Add the second tall cabinet, align it, and screw it to the wall. Mark and cut a trim board to fit between the floor and the bottoms of the cabinets. Drill holes through the trim board and screw it to the blocking.



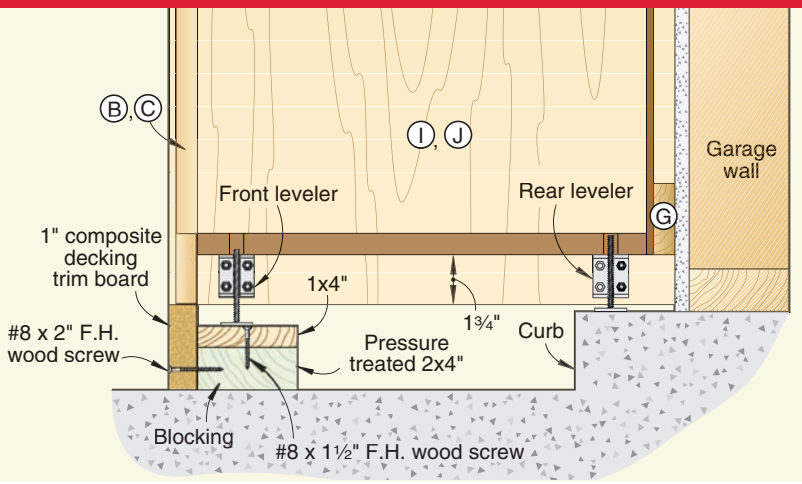
Step 6 Retrieve the hinge spacer, and using it to position each bottom hinge, hang the doors. On the tall doors, flip the center hinge leaf onto the stile, drill pilot holes, and drive the screws. Install the shelves and drawers.

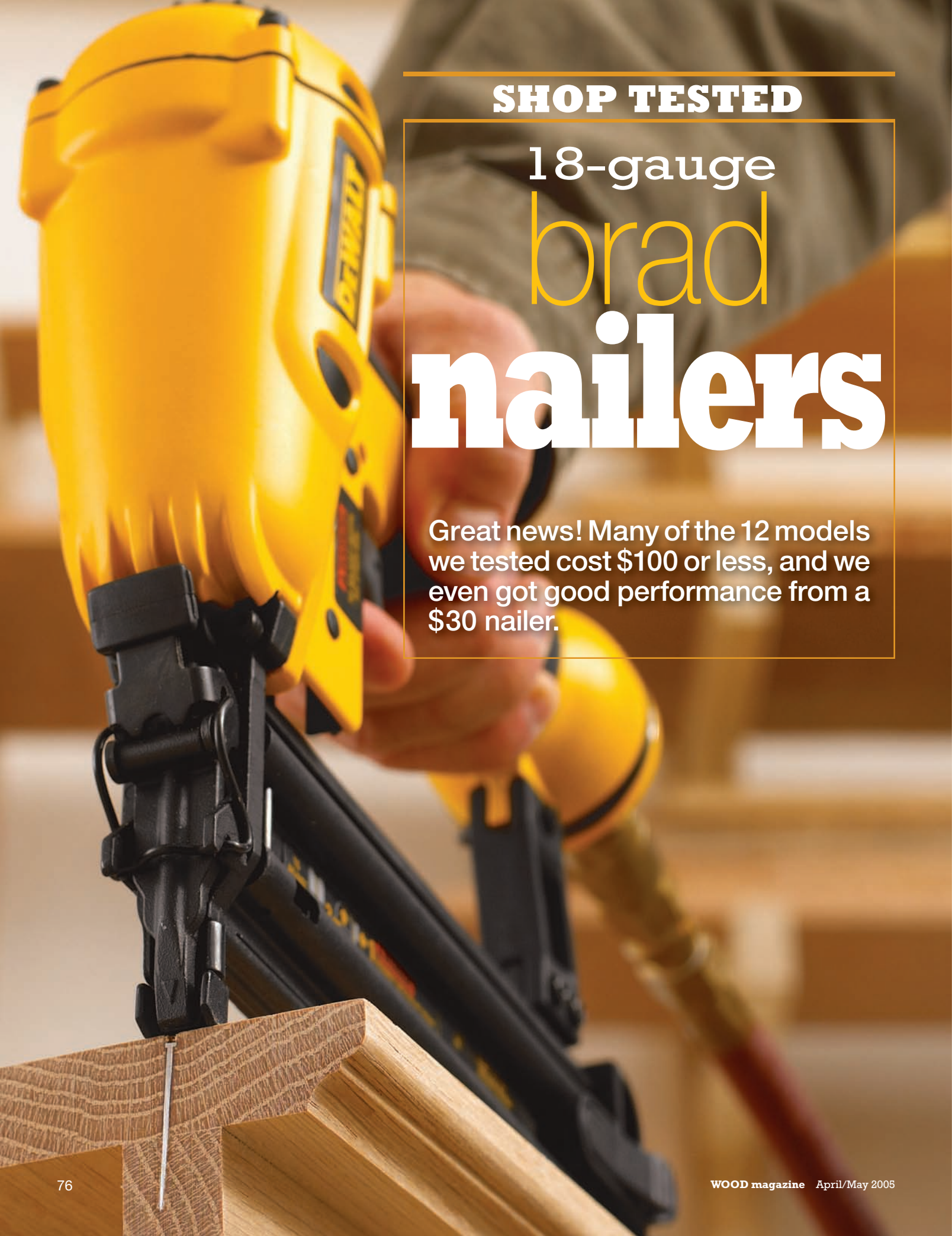
SHOP TIP

Hopping the curb gains inches

In most garages, every square inch of floor space counts. If your garage has a low curb at the perimeter preventing your storage system cabinets from being pushed tightly against the wall, hogging up valuable inches, here's a way to get over it.

Select a combination of dimension lumber thicknesses (pressure-treated on the bottom) that comes close to the height of the curb. Cut the pieces to the combined length of the cabinets, and screw them together. With the cabinet rear levelers on the curb, position the dimension-lumber blocking under the front levelers, where shown *at right*. When all the cabinets are in place, screw a piece of composite decking to the blocking to hide it and the gap between the blocking and the cabinets.





SHOP TESTED

18-gauge brad nailers

Great news! Many of the 12 models we tested cost $100 or less, and we even got good performance from a $30 nailer.

Whether you buy a pneumatic brad nailer to save your thumb from an accidental beating, or to save time during project assembly, you'll never want to live without one of these tools after trying one. For this article, we tested brad nailers with a maximum nail length of 2" or 2⅛", but you'll find many similar units that max out at 1⅝". The 2" fasteners provide better holding power and prove ideal for wall and ceiling molding installation.

Brad nailers have more good points than bad

The cool stuff about brad nailers far outweighs the not-so-cool stuff:

Cool stuff:

• ***Free up clamps in short order***
Apply the glue and clamp the assembly, punch in a few brads to secure the joint, and reclaim your clamps immediately for the next glue-up.

• ***Speedy, glueless assembly***
You can assemble birdhouses and craft items in no time flat. Cabinet backs go on in a flash.

• ***Forgiving***
Unlike a screw or ordinary nail, an 18-gauge brad won't seriously damage a blade or bit should you accidentally saw or rout through it.

• ***No-stick stack-cutting***
Instead of using double-faced tape to hold together workpieces for stack-cutting on a bandsaw or scrollsaw, tack them together with brads fired into the waste area.

• ***Reinforce mitered joints***
End-grain to end-grain joints, such as the mitered corners of a picture frame, are stronger when fortified by a steel fastener.

• ***Less splitting***
A brad's small diameter and speed of penetration lessens the likelihood of splitting—even in small moldings and fragile workpieces—without predrilling.

Not-so-cool stuff:

• ***Compressed air required***
Although airless nailers have come on the scene recently (see *page 81*), most nailers still require an air compressor. A small one will set you back $150 or so.

• ***Willy-nilly wire***
Brads are made of wire, and they can veer off course, following the grain of the wood right out the side of your workpiece.

Our performance grading starts with a 2" test drive

To measure the driving power of these nailers, we drove 2" brads into white oak and hard maple, about as tough a test as you'll find in your shop. Because the nailers in our test have different maximum air-pressure specs, we tested each nailer at its maximum recommended pressure, then dialed down the pressure in 10-psi increments.

At maximum pressure, most of the nailers reliably and consistently sank the longest fasteners in both hardwoods. However, the Campbell Hausfeld CHN10299 left all of its fasteners standing about ½" proud of the test boards. Campbell Hausfeld's Dan Harty told us, "We respect the test results, and note that this is an affordable, entry-level nailer for most common woodworking applications. Some extreme applications may require more power than an entry-level unit can provide." The Craftsman 18172 and Makita AF503 each left a few brads just slightly proud.

When compared head-to-head at lower pressures, a few nailers still performed admirably despite operating at pressures 15–20 psi lower than their recommended max: the DeWalt D51238K, Porter-Cable BN200A, Ridgid R213BNA, and Senco FP25XP. Curious, we lowered the pressure to 90 psi and found that the DeWalt and P-C nailers could still consistently sink the 2" fasteners. That means you can confidently run these nailers at a lower pressure, which should extend the life of the tool.

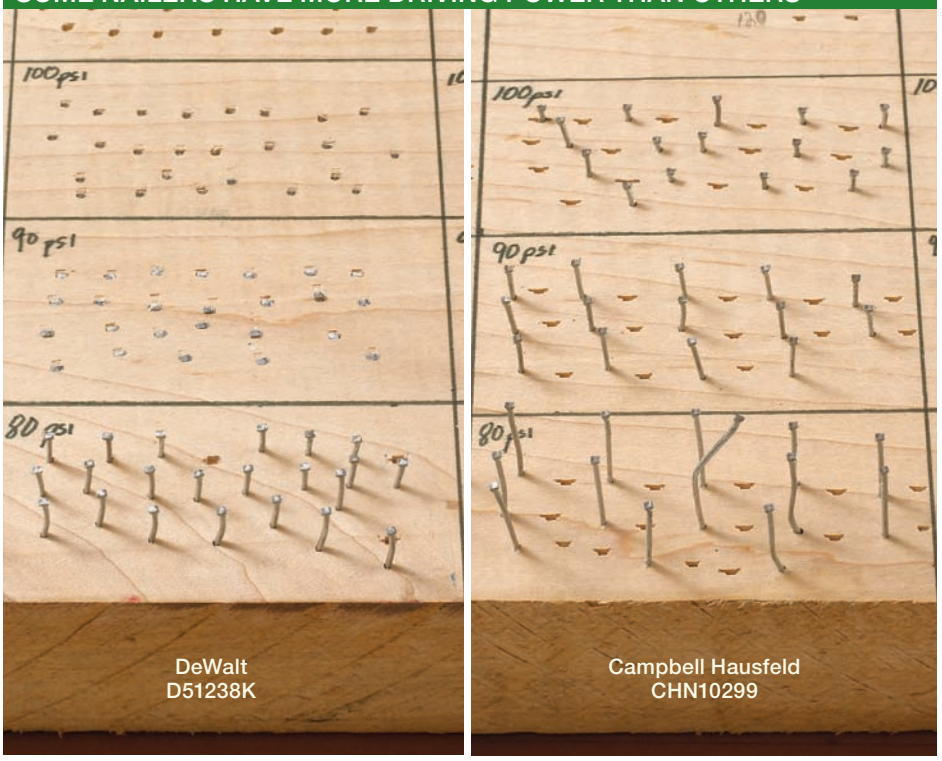
Ideally, a brad nailer should sink the fastener about 1/16" below the surface of the wood. Any shallower, and the hole won't hold filler well. Fortunately, nine of the tested nailers (see which ones in the chart on *page 81*) have a drive-depth adjustment system (a thumbwheel or slide bar) to fine-tune the drive depth, something you'll typically need to do when you switch between hardwoods and softwoods. You can adjust the drive depth with the remaining nailers with the regulator on your air compressor.

Fastener placement: Can you get there from here?

In our tests, we found two things impacted our ability to put a nail right where we wanted it: the width of the contact safety trip (the part that must touch the workpiece before you can fire a fastener) and the location of the trip. (We prefer trips located behind the nailer's nose—where the brad exits the tool—to trips located forward of the nose.)

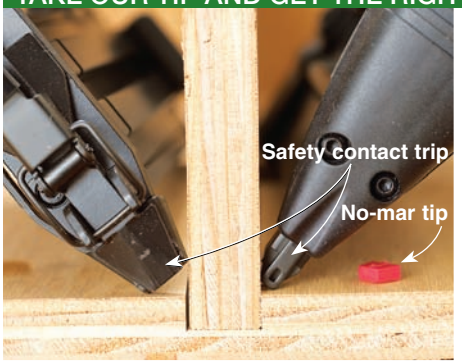
For the best control of brad placement, opt for a tool with a narrow, rear-mounted con-

SOME NAILERS HAVE MORE DRIVING POWER THAN OTHERS

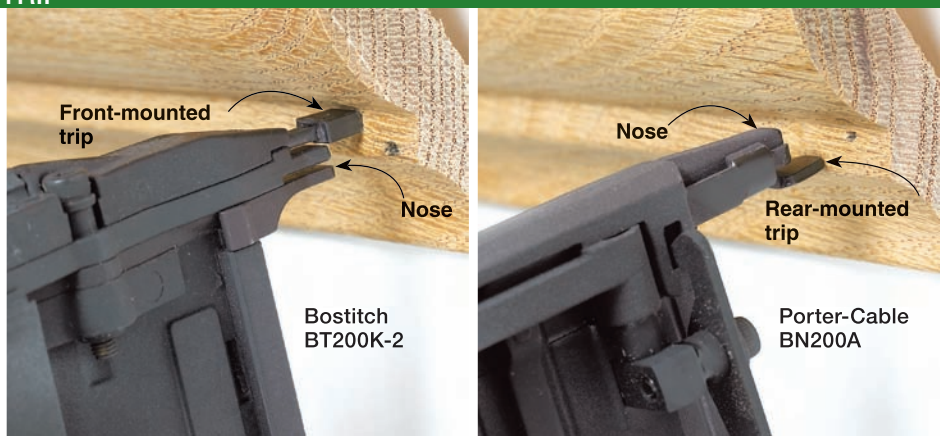


Punching 2" brads into hard maple requires a lot of power, and the DeWalt and Porter-Cable nailers proved efficient enough to do it even at pressures 30 psi less than their maximum pressure rating. At the other end of the scale, the Campbell Hausfeld left fasteners proud of the surface even when operated at its maximum recommended pressure of 100 psi.

TAKE OUR TIP AND GET THE RIGHT TRIP



The wide contact safety trip on the Hitachi NT50AE (left) kept us from getting a brad tight in the corner when tacking this shelf into a dado. Craftsman's narrow trip (right), with the no-mar tip removed, drove right into the corner to hide the fastener.



The front-mounted contact-safety trip on the Bostitch BT200K-2 made a tight corner placement impossible. On the other hand, the rear-mounted trip on the Porter-Cable BN200A allowed us to place the brad within 1/64" of a tight corner.

tact trip. The photos, *above*, illustrate how such a trip allows the nose of the nailer to get into tight corners. Even if you never work with crown molding, a rear-mounted contact-safety trip—regardless of its width—provides a better view of the nose than a front-mounted trip.

Three tips to better brad nailing

1 ***Take a test-drive.*** In woodworking, it pays to test a process in scrap before you try it on your project. In this case, that means driving a few brads into scrap project parts and adjusting the drive depth so that the fastener sets about 1/16" below the surface.

2 ***Use a light touch.*** Much of the marring from a brad nailer comes not from the driving force of the nailer, but from the operator pressing too hard when pulling the trigger. Even a slight recoil from the nailer causes it to lift slightly off the wood, causing the nose of the nailer to hit the wood again, leaving a dent.

3 ***Minimize side blowout.*** An 18-gauge brad is easily influenced by wood grain, as you can see from the photo *above*. Not only does this mar your project, but a finger in the way could be punctured as well. To minimize blowout, steer clear of knots or dense grain, and use the correct length of fastener (about twice as long as the thickness of the material you're driving through).

Three more features that matter in a brad nailer

•Sequential-fire mode. These nailers have one of two firing modes: *sequential* firing (you must depress the safety contact trip, then pull the trigger, in that order) or *contact* ("*bump*") firing (the trigger and trip can be engaged in any order).

Contact firing is more versatile because it gives you the option of holding the trigger, and then repeatedly bumping the trip against the workpiece and driving a brad with each bump. But that also means the nailer can double-fire if recoil from driving the first fastener lifts the nailer enough.

With a sequential-fire nailer, the trigger must be released before you can drive another fastener, and we found this system the safest. In our tests, however, we discovered that we could bump-fire the Makita AF503 and Senco FPXP25, even though they are sold as sequential-fire nailers.

•Quick-release nose. In more than a month of testing and routine use, we didn't jam a brad in any of the tested nailers, as long as we kept the air pressure at the top of their recommended range. (We had to drive brads into a steel plate to create jams for this test!) That's good news for you, as is the fact that most manufacturers have changed to a tool-free nose that opens with a flick of a lever, should you ever need to remove a jammed fastener. (See photo at *right*.) We downgraded the DeWalt slightly because the nose swings open only about 30°, limiting access.

Of the nailers without quick-release noses, the Grizzly H5527 and Makita AF503 each require removing two screws to open the nose. On the Craftsman and Senco, jammed fastners must be removed through the magazine itself, which sometimes requires both patience and needle-nose pliers.

•Dry-fire preventors. Want to wear out your brad nailer prematurely? Fire it with no fasteners in the magazine. To help their tools last longer, and to help you avoid poking empty dents into your projects, Makita, Ridgid, and Senco employ dry-fire preventors that won't allow the tool to operate with an empty magazine.

In fact, Makita's system of indicating how many brads remain in the magazine is the best in the test, with a large viewing window and a red pointer that shows the exact number of brads. Indicators on the Craftsman, Grizzly H5527, and Hitachi are the hardest to read, owing to small viewing windows, and/or indicators that make it look like you have a few fasteners left even when the magazine is empty.

CHOOSE YOUR NOSE

To clear a jammed fastener from the Craftsman nailer (top), you must pull it out through the magazine—a sometimes tricky task. Quick-release noses, such as this one on the Grizzly G6047 (bottom), open by simply flipping down the red lever.

Here's what we liked (and didn't) about these nailers

Bostitch BT200K-2, $95
800/556-6696, bostitch.com

High points
- We couldn't get this nailer to jam, even when driving 2" brads into steel.
- Oil-free design eliminates regular maintenance.

Low points
- Front-mounted contact safety trip blocks view of the drive path, making it difficult to place brads precisely.

DeWalt D51238K, $120
800/433-9258, dewalt.com

High points
- Can drive 2" brads into hardwood at 30 psi less than its maximum recommended pressure, which should extend the life of the tool.
- Small rear-mounted contact safety trip makes it easy to see the nail path and accurately put brads close to obstructions.
- Little jamming, even when driving at low pressure into steel.
- Depth-setting slide bar is easy to use, lockable, and repeatable (you can return to a previous setting with the help of indexing lines on the bar).

Low points
- Quick-release nose swings open only about 30°, limiting access to the drive path when you need to clear a jammed fastener.
- This nailer requires both oil and a ¼" quick-connect fitting, neither of which is provided with the tool.

More points
- Although the D51238K ships from the factory as a sequential-fire unit, DeWalt sells an accessory trigger (part no. D510020) that turns it into a contact-firing nailer.

Campbell Hausfeld CHN10299, $50
888/247-6937, chpower.com

High points
- With the no-mar tip removed, the small rear-mounted contact safety trip allowed us to place brads accurately and close to obstructions.
- Low price.
- Kit comes with an extra no-mar tip.

Low points
- This is the only nailer in our test that couldn't fully drive a 2" fastener into oak or hard maple. (It's fine, however, for less-dense materials, such as softwoods and installing molding in the home.)

More points
- It's the heaviest nailer in the test, but that weight helps dampen recoil.
- Available exclusively at Harbor Freight Tools (800/423-2567, harborfreight.com).

Grizzly G6047, $120
800/523-4777, grizzly.com

High points
- The small rear-mounted contact safety trip allowed us to place brads accurately and close to obstructions.

Low points
- No on-tool drive-depth adjustment.
- Contact safety trip tends to dent even hardwoods; a no-mar tip does not come with this nailer.

Craftsman 18172, $110
800/377-7414, craftsman.com

High points
- We found it difficult to jam fasteners in this model, even at low air pressure in steel.
- Oil-free design eliminates regular maintenance.
- Comes with an assortment of brads ranging in length from ⅝" to 2".

Low points
- Jammed fasteners, though rare, must be removed through the magazine.
- Low/empty-magazine indicator is difficult to read.
- Rear exhaust can blast operator in the face when the tool is used overhead.

More points
- Switch allows user to select from sequential-fire mode or contact-fire mode.

Grizzly H5527, $30
800/523-4777, grizzly.com

High points
- With 100 psi of pressure, this $30 nailer drove brads as efficiently as other tools costing 3–4 times as much.

Low points
- The low/empty magazine indicator is small and difficult to read. We found it easier to just open the magazine to check on the fastener supply.
- No on-tool drive-depth adjustment.
- Contact safety trip tends to dent even hardwoods; a no-mar tip does not come with this nailer.

More points
- Despite its shortcomings, it's hard to argue with the value of a powerful $30 bare-bones nailer. We named the H5527 the Top Value.

Hitachi NT50AE, $90
800/706-7337, hitachipowertools.com

High points
- 5-year warranty is the longest in the test.

Low points
- Low/empty-magazine indicator doesn't show until only three brads remain and doesn't close completely when empty.
- We experienced some marring in hardwoods, possibly from the strong recoil of this unit.
- Nailer requires oil, but none is provided.

Makita AF503, $115
800/462-5482, makitatools.com

High points
- Little jamming, even when driving at low pressure into steel.
- Dry-fire preventor won't allow the nailer to fire with an empty magazine, saving wear. Also, the best-in-test low/empty-magazine indicator shows exactly how many brads remain.
- The extra no-mar tip that comes with the nailer stores on the tool.

Low points
- Although this is a sequential-fire nailer, we found it easy to override the mechanism and bump-fire it.
- No on-tool drive-depth adjustment.

More points
- Available with 3.3-gallon compressor and hose (model MAC700KIT) for $260.

Paslode T200F18, $100
800/682-3428, paslode.com

High points
- Small rear-mounted contact safety trip makes it easy to see the nail path and accurately put brads close to obstructions.
- Large viewing window in magazine shows exactly how many brads remain.

Low points
- We found the directional exhaust at the top of the nailer stiff and somewhat hard to adjust.

Porter-Cable BN200A, $100
800/487-8665, porter-cable.com

High points
- Can drive 2" brads into hardwood at 30 psi less than its maximum recommended pressure, which should extend the life of the tool.
- Small rear-mounted contact safety trip makes it easy to see the nail path and accurately put brads close to obstructions.

Low points
- The quick-release nose felt tight when clearing jams, but may loosen with time.

More points
- Available with a 6-gallon compressor and hose (model CFBN200A) for $240.
- The BN200A has both performance and price going for it, so we named it the Top Tool.

Ridgid R213BNA, $130
800-474-3443, ridgid.com

High points
- Small rear-mounted contact safety trip makes it easy to see the nail path and accurately put brads close to obstructions.
- Dry-fire preventor won't allow the nailer to fire with an empty magazine, saving wear.
- Built-in air filter protects internal components from debris, and self-cleans when hose is removed.
- Oil-free design eliminates regular maintenance.

More points
- Switch allows user to select from sequential-fire mode or contact-fire mode.
- ¼" quick-connect swivel fitting makes nailer less unwieldy, but also more difficult to connect hose.

Senco FP25XP, $150
800/543-4596, senco.com

High points
- We couldn't get this nailer to jam, even when driving 2" brads into steel.
- Dry-fire preventor won't allow the nailer to fire with an empty magazine, saving wear.
- Extra no-mar tip and wrenches store on the tool.
- Oil-free design eliminates regular maintenance.

Low points
- Although this is a sequential-fire nailer, we found it easy to override the mechanism and bump-fire it.
- Jammed fasteners, though rare, must be removed through the magazine.
- ¼" quick-connect fitting is not provided with this brad nailer.

NAILING DOWN THE BEST OF THE 18-GAUGE BRAD NAILERS

		CAPACITY			CONSTRUCTION						PERFORMANCE GRADES (5)													
BRAND	MODEL	FASTENER LENGTHS (INCHES)	FASTENER CAPACITY	AIR PRESSURE RANGE (PSI)	SAFETY/SWITCH TYPE (1)	DRIVE-DEPTH ADJUSTMENT (2)	CONTACT SAFETY TRIP LOCATION (FRONT/REAR)	OIL-LUBE (O) OR OILLESS (L)	EXHAUST TYPE (3)	LOW/EMPTY INDICATORS (4)	DRIVING EFFICIENCY (6)	PRECISE PLACEMENT OF BRAD	LACK OF SURFACE MARRING	JAM CLEARING EASE	LOW/EMPTY INDICATORS	LACK OF RECOIL	EASE OF SETTING DRIVE DEPTH	HANDLE AND TRIGGER COMFORT	STANDARD ACCESSORIES (7)	WEIGHT (POUNDS)	DIMENSIONS (H x W x L, INCHES)	WARRANTY	COUNTRY OF ASSEMBLY (8)	SELLING PRICE (9)
BOSTITCH	BT200K-2	5/8–2	100	70–120	SF	T	F	L	R	B	C	A	A-	A	B	B	A	A	N,Q,W	2.2	9½x2¼x10	1 yr.	U	$95
CAMPBELL HAUSFELD	CHN10299	5/8–2	100	60–100	SF	T	R	O	D	B	D	A	B+	A	B	A	B	B	N,O,Q,W,X	3.4	9x2¼x10	3 yr.	C	50
CRAFTSMAN	18172	5/8–2⅛	100	60–100	CF	T	F	L	R	B	B	B+	A-	C	C	A	B-	B	N,Q,W,X	2.8	9½x2¼x9½	1 yr.	T	110
DeWALT	D51238K	5/8–2	110	70–120	SF*	S	R	O	D	B	A	A	A	A-	B	A	A	A-	G,W	2.9	8¾x2¼x9	3 yr.	T	120
GRIZZLY	G6047	5/8–2	100	70–110	CF	A	R	O	D	B	B	A	C	A	B-	A	C	A-	G,N,O,Q,W	3.0	10x2 3/16x10	1 yr.	T	120
	H5527	3/8–2	100	70–110	CF	A	R	O	D	B	B	A	C	B-	C	B-	C	B-	G,O,Q,W	3.1	10x2x9¾	1 yr.	C	30
HITACHI	NT50AE	¼–2	100	70–120	CF	A	R	O	D	B	B	B+	C	A	D	C-	C	A	G,Q,W	3.1	9 5/8x2⅛x10	5 yr.	T	90
MAKITA	AF503	5/8–2	100	60–115	SF	T	F	O	D	B,D,V	B	A	A	B-	A	A	C	A	B,G,O,Q,W	3.2	9¾x2 7/16x9¾	1 yr.	T	115
PASLODE	T200F18	5/8–2	100	70–100	SF	T	R	O	D	V	B	A	A	A	A-	B-	B-	A	G,O,Q,W	2.1	9¾x2¼x9¾	90 days	T	100
PORTER-CABLE	BN200A	¾–2	110	70–120	SF	T	R	O	D	B	A	A	A	A-	B	A	A-	A	N,O,Q	2.9	10x2¼x10	1 yr.	T	100
RIDGID	R213BNA	5/8–2⅛	105	70–120	CF	T	R	L	R	B,D	B	A	A	A-	A	B	A-	A	B,G,N,Q,W,X	2.4	10x2¼x9¾	3 yr.	T	130
SENCO	FP25XP	5/8–2⅛	110	70–120	SF	T	F	L	D	D	B	B-	A	C	A-	B	A-	A-	B,X	2.7	9⅞x2 3/16x10	2 yr.	T	150

NOTES:

1. (CF) Contact-fire or sequential-fire
   (SF) Sequential-fire
   (*) Switchable to sequential-fire with accessory trigger
2. (A) Adjust air pressure at compressor
   (S) Slide bar
   (T) Thumbwheel
3. (D) Directional
   (R) Rear
4. (B) Indicator bar
   (D) Dry-fire preventor
   (V) View window
5. A Excellent
   B Good
   C Fair
   D Poor
6. Lowest air pressure at which the tool could sink a 2" brad into oak
   A 90 psi
   B 100 psi
   C 110 psi
   D Couldn't sink brad at max. recommended pressure.
7. (B) Belt clip
   (G) Safety glasses
   (N) Nails
   (O) Oil
   (Q) ¼" Quick-connect air fitting
   (W) Wrenches
   (X) Extra no-mar tip
8. (C) China
   (T) Taiwan
   (U) United States
9. Prices current at time of article production and do not include shipping where applicable.

Four more drivers you should know about

A brad nailer will handle most of your nailing chores, but you'll also want to consider these power fastening tools.

• Narrow crown stapler

Two legs double a staple's holding power, and the ¼" crown (the bridge between the legs) resists accidental pull-through on thin materials. But the crown leaves a wider hole to fill. A narrow crown stapler works great for fastening ⅛" or ¼" plywood or hardboard backs or bottoms on cases and boxes.

• Pinner

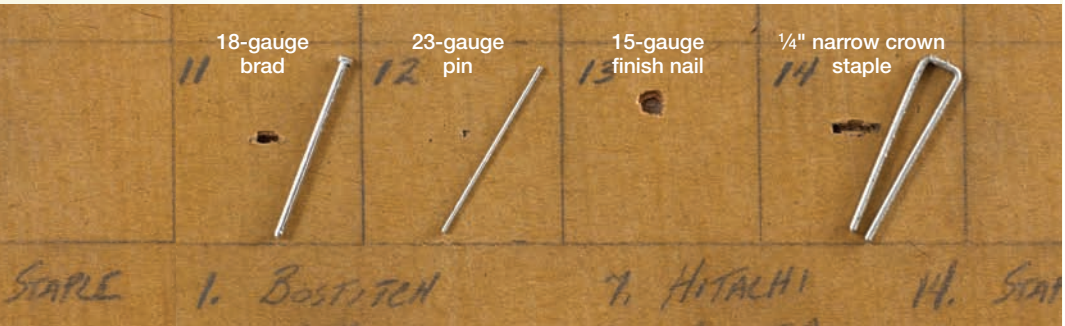
Sometimes called a "micropinner," these tools drive a superfine 23-gauge (about 1/64") headless nail that leaves a virtually invisible entry hole in your workpiece. (See photo, *below.*) That means no holes to fill and less splitting—even in very narrow or thin materials—than a brad nailer. This tool's limitation is fastener length: Most pinners max out at 1".

• Nailer/stapler combo drivers

With the ability to drive both brads and narrow crown staples, it's like having the best of both worlds for the price of one tool. Switching from brads to staples and back requires simply swapping fasteners in the tool's magazine. The cost of this versatility is that the driver leaves a staple-size hole even when driving brads.

• Airless nailers

These battery-powered tools use a variety of technologies to drive 18-gauge brads. You'll pay for compressor-less convenience, though. Some models cost nearly as much as a pneumatic nailer/compressor combo kit. (For an overview of airless nailers, see *WOOD*® magazine issue 145, pages 29-30.)



Our picks of the nailers

Two nailers performed well in virtually every category we tested: the DeWalt D51238K and the Porter-Cable BN200A. But we gave the P-C nailer the edge and named it Top Tool because it costs $20 less than the DeWalt, and comes with everything you need to get started. (With the DeWalt, you still need to add a quick-connect fitting and tool oil.)

If you want a brad nailer for occasional use, and don't want to spend a lot of money, opt for the Grizzly H5527. You'll give up such features as on-tool depth adjustments and a reliable low-magazine indicator, but this tool gets the job done for only $30. It's our Top Value.

Written by **Dave Campbell** with **Jeff Hall**

Share your opinion
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store 'n' sit outdoor bench

Stow deck, patio, or garden accessories in this seat for two.

To store or retrieve items from the bench, lift the seat lid. Chains safely hold it open.

Check out the matching pieces

Want to spruce up your outdoor living spaces with complementary Adirondack-style pieces sporting the eye-catching tree motif? You'll find the plans for the double settee in issue 125, planter in issue 148, chair and footrest in issue 149, and glider in issue 155. If you don't have these issues, see **Sources** on *page 87* to obtain the plans.

AT A GLANCE

- Overall dimensions are 51½" wide × 23½" deep × 21fi" high.
- For the board feet of lumber and other items needed to build this project, see *page 87*.

Need a weatherproof place to keep seat cushions or other outdoor items? This sturdy project, with hinged seat lid, may be just the ticket. For durability, the bench is made with exterior plywood (for the inner case) and decay-resistant cedar. You'll find these materials and all of the needed supplies to build this beauty at your local home center.

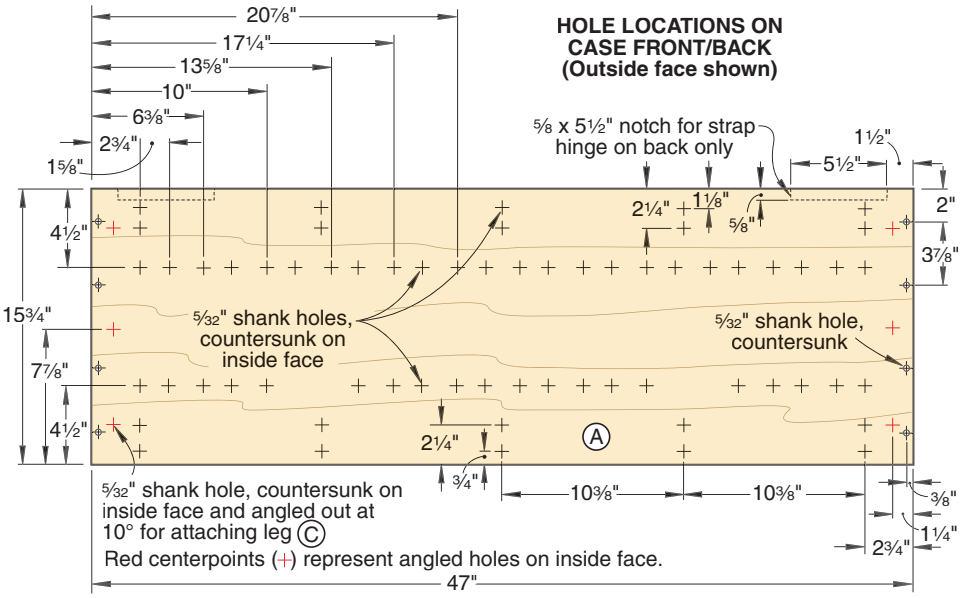
Start with the case

1 From exterior-grade ¾" plywood that has two smooth, paintable faces, cut the case front/back (A) and sides (B) to the sizes listed in the **Materials List**. We used type AC fir plywood. As an alternative, you also can use oriented strand board (OSB) panels.

2 On the back (A), lay out the ⅝×5½" notches for the strap hinges, where dimensioned on **Drawing 1**. Jigsaw the notches to shape.

Note: The bench design dictated that we use screws instead of glue to attach all of the cedar to the stained plywood case. Although you'll need to lay out and drill quite a few holes in the case for attaching these parts, this mounting method ensures the bench will stand up well to Mother Nature and give you years of enjoyment.

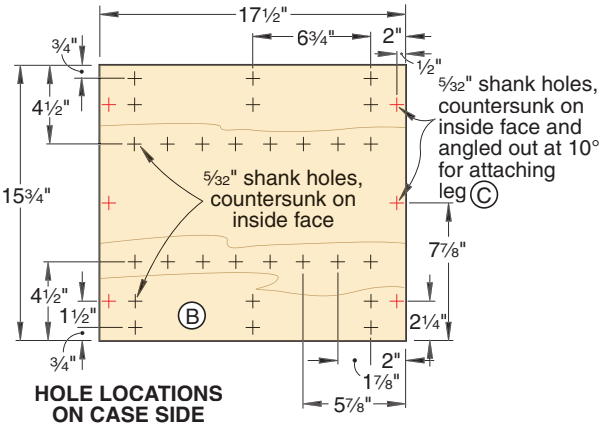
3 Mark the best face of the front/back and sides for the *outside* and the top of the front. Then, on the outside face of the front (A) and a side (B), mark centerpoints for all of the mounting holes, where dimensioned on **Drawing 1**, except for the three shank holes angled at 10° near the ends of the parts for attaching the legs (C). Don't worry about the pencil marks. You'll cover them with solid stain later.



1 PARTS VIEW

4 Pair and clamp together the front/back and the sides with their *inside* faces together and edges flush. Now drill ⅝2" shank holes through the paired parts at the marked locations. Separate the parts, and countersink the holes on the appropriate faces, where shown. (To provide space to accommodate any material pull-out when screwing external parts to the case, you can countersink all of the holes on both faces, as we did for our project.)

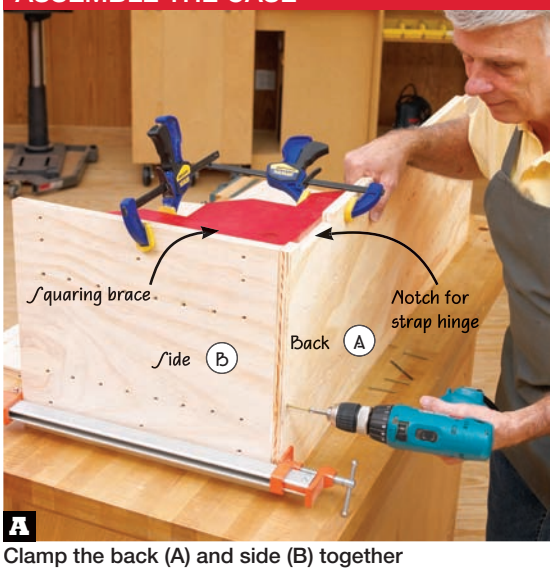
5 On the *inside* face of the front/back and sides, lay out the locations for the three angled mounting holes at the ends, where dimensioned on **Drawing 1** and shown on **Drawing 2a**. Then, using a guide as explained in the **Shop Tip**, *below*, drill the shank holes. Now countersink the holes.



HOLE LOCATIONS ON CASE SIDE (Outside face shown)

6 Using a shop-made squaring brace, glue and clamp together the back (A) and a side (B), as shown in **Photo A**, with the *outside* faces out. Using the shank holes in the back

ASSEMBLE THE CASE



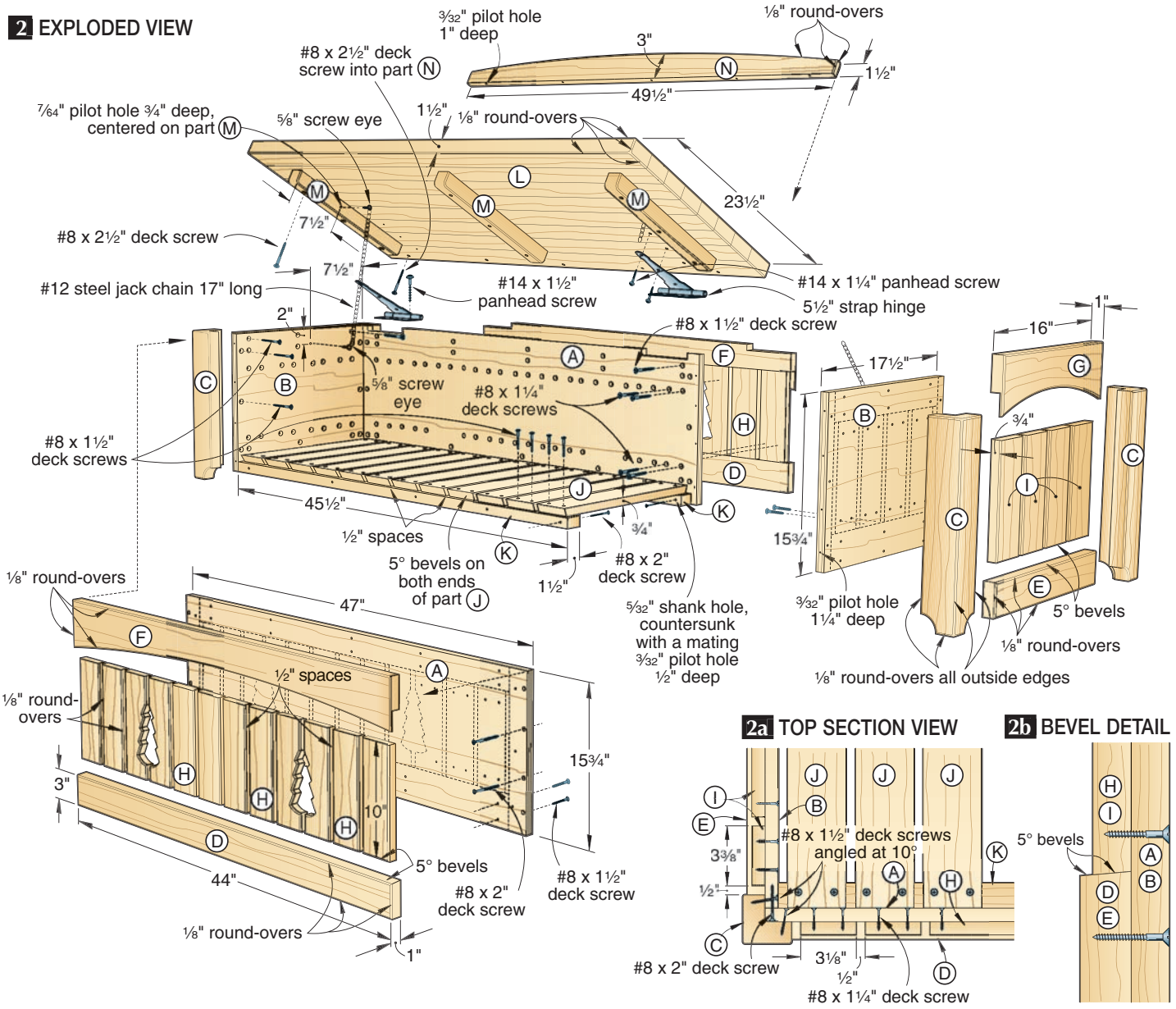
A

Clamp the back (A) and side (B) together using a squaring brace to keep the parts square. Then drill the pilot holes in the side.

SHOP TIP

A scrap makes a handy guide for drilling angled holes

Here's an easy way to accurately drill angled holes, such as those in the front/back (A) and sides (B) for attaching the legs (C), using a portable drill. Bevel-cut the end of a 1×1×6" scrap at the needed hole angle (10° for the bench). Holding the scrap on your workpiece and the drill bit flush against the bevel, as shown at *right*, drill the hole.



as guides, drill 3/32" pilot holes 1¼" deep in the side, where shown on **Drawing 2**. Secure with #8×2" deck screws. Repeat the process to assemble the other side (B) and front (A), making sure the top of the front is up.

7 Sand the inside and outside faces and the edges of the case to 150 grit. Remove the dust. Then stain the entire case. (We applied two coats of Olympic Solid Color Deck Stain, acrylic latex, Faulkland color.)

Next up: the legs

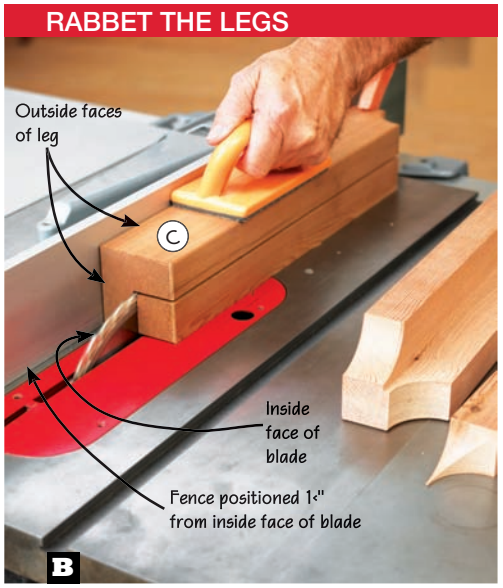
1 From 4×4 cedar and working around the knots, cut four clear 18"-long pieces for the legs (C). (To crosscut through the 4×4 with a 10" tablesaw blade, you'll need to make two cuts on opposite sides. Cutting the legs extra long lets you trim the ends smooth after planing the legs to the finished size.) Joint and square two faces on each leg. Then plane the remaining two faces for a finished size of 2¾" square. Now trim the ends of the legs for a final length of 17".

2 Identify the two best faces on the legs for the outside. Then mark 1¼" radii on these faces at the bottom, where shown on **Drawing 3**. Bandsaw the radii to shape, and sand smooth with a 2½"-diameter, 120-grit sanding drum. For an alternative method to

SHOP TIP

A fast and simple way to form perfect radii in legs

Instead of using your bandsaw to cut radii in legs, such as those in the bottom of the bench legs (C), you can bore them quickly using a Forstner bit, as shown at *right*. (You'll need a 2½"-diameter bit to bore the 1¼" radii in the bench legs.) The advantages? You'll form identical radii, and the bit will leave a smoother surface needing little sanding. Also, for very long legs, you avoid the hassle of manipulating and safely supporting them on a small bandsaw table. For exact positioning of the radii, be sure to clamp a stopblock to your drill-press fence, as shown.



Keeping the outside faces of each leg (C) against your tablesaw fence, make two cuts to form a 1⅛" rabbet 1⅛" deep.

form precise radii, see the **Shop Tip**, *opposite page, bottom*. Now rout ⅛" round-overs on the legs, where shown.

3 To cut a 1½" rabbet 1½" deep in the legs, where shown, position your tablesaw fence 1¼" from the ***inside*** face of the blade. Using a pushblock and pushstick for safety, make two 1½"-deep cuts to form the rabbet in each leg, as shown in **Photo B**. Before you make the second cut in each leg, flip it end-for-end and rotate it to position the *outside* face against the fence.

On to the rails

1 To determine the exact lengths for the bottom front/back rails (D), bottom side rails (E), top front/back rails (F), and top side rails (G), clamp (no glue) the legs (C) to the plywood case assembly (A/B) with the legs flush with the top of the case. (Due to differences in plywood thickness, the rail lengths may vary.) Measure between the legs for the rail lengths. Then, from 1"-thick cedar, cut the rails to the widths listed and the measured lengths. Remove the legs.

2 Angle your tablesaw blade to 5° from vertical. Then bevel-rip the top edge of the bottom front/back rails (D) and bottom side rails (E), where shown on **Drawings 2** and **2b**. (The bevels promote water runoff.)

3 Return your saw blade to vertical. Then, making two cuts, form a 1¾" rabbet ¾" deep in the top front/back rails (F) and top side rails (G), where shown on **Drawing 4**.

4 Mark the center of the arches on the top rails, where dimensioned. Using a fairing stick, draw the arches. Then bandsaw and sand them to shape. (For a free fairing stick plan, go to woodmagazine.com/fairing.)

5 Rout ⅛" round-overs on the top rails (F, G) and bottom rails (D, E), where shown on **Drawing 2**. Then, on the top back rail (F), lay out ⅝×5½" notches for the strap hinges, where shown on **Drawing 4**. Jigsaw the notches.

Prepare the slats and cleats

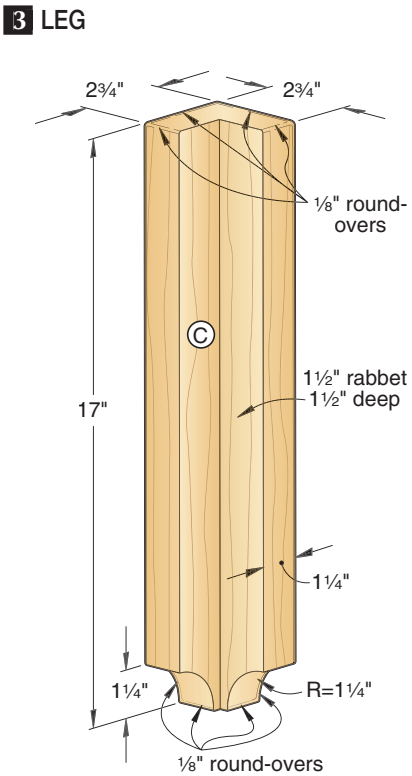
1 From ¾"-thick cedar, cut the front/back slats (H), side slats (I), and bottom slats (J) to the sizes listed. From 1"-thick cedar, cut the bottom cleats (K) to size. Mark the part letters on the slats to keep them straight.

2 Crosscut a 5° bevel on the bottom ends of the front/back slats (H) and side slats (I), where shown on **Drawings 2** and **2b**, to mate with the beveled top edges on the bottom front/back rails (D) and bottom side rails (E). Mark the top ends of the slats to ensure correct orientation during assembly. Also, to make it easy to lower the bottom slats (J) into position and prevent marring of the stained plywood case, crosscut a 5° bevel on both ends of the slats, where shown on **Drawing 2**.

3 To form the tree cutouts in the front/back slats (H), where shown on **Drawing 2**, make four copies of the full-size tree pattern from the *WOOD Patterns*® insert. Split the patterns by cutting along the lines, where shown. Then spray-adhere the pattern halves to eight slats, aligning the patterns with the bottoms and sides of the slats. Bandsaw or scrollsaw the cutouts to the pattern lines, and sand the edges smooth. Remove the patterns using a cloth moistened with paint thinner.

4 Remove the dust from the edges of the cutouts. Then apply two coats of stain to the edges. After the stain dries, rout ⅛" round-overs along the outside edges of the front/back slats (H), including the tree cutouts, and the side slats (I), where shown on **Drawing 2**.

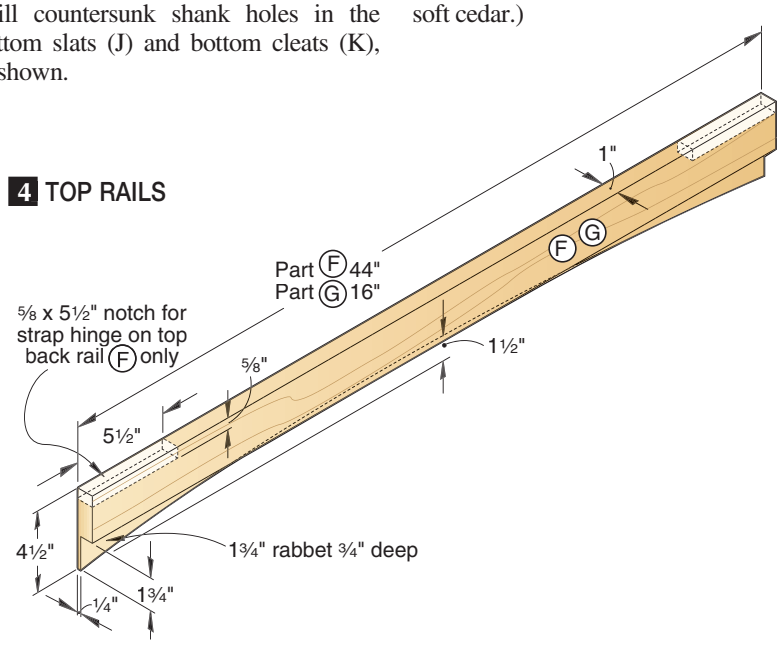
5 Drill countersunk shank holes in the bottom slats (J) and bottom cleats (K), where shown.



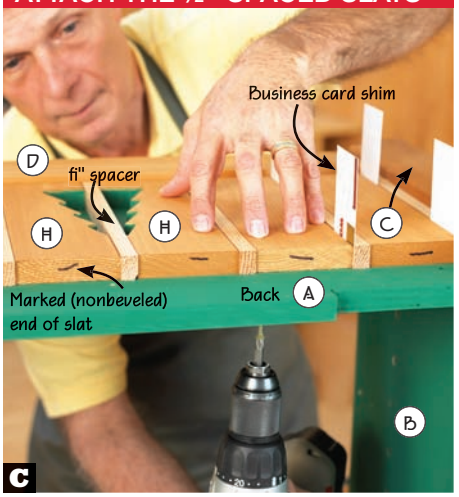
Finish/complete the case

1 Sand all of the cedar parts you've made so far to 150 grit, and remove the dust. Apply two coats of an exterior sealant to the parts, being careful not to get any on the stained tree cutouts. (We used Wolman RainCoat Water Repellent, cedar tone.)

2 After the finish dries, position and clamp the legs (C) to the case (A/B) as before. From inside the case, drive #8×1½" deck screws through the angled countersunk shank holes into the legs, where shown on **Drawings 2** and **2a**. (Except where noted, we did not drill pilot holes for driving screws into the soft cedar.)

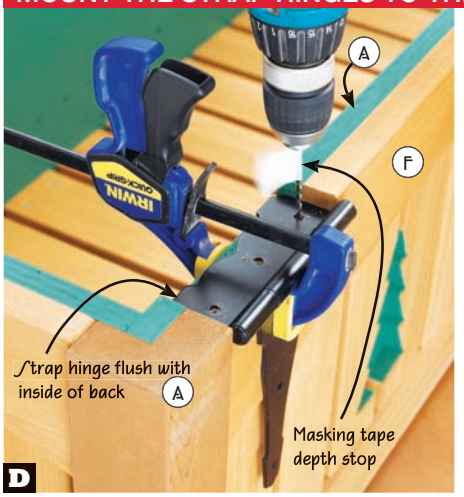


ATTACH THE ½"-SPACED SLATS

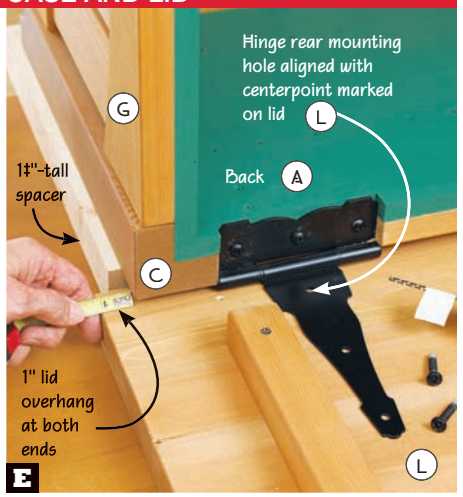


Holding each slat (H) firmly against the back (A), drive screws through the countersunk shank holes inside the case into the slat.

MOUNT THE STRAP HINGES TO THE CASE AND LID



Clamp 5fi" strap hinges in the notches, flush with the inside edge of the case back (A). Drill pilot holes, and drive the screws.



Align the hinge rear mounting holes with the marked centerpoints on the lid (L). Verify the lid overhangs the case 1" at both ends.

3 Clamp the bottom front/back rails (D) and bottom side rails (E) in position on the case. Drive #8×1½" deck screws through the countersunk shank holes from inside the case into the rails, where shown on **Drawing 2**.

4 To position the front/back slats (H) and side slats (I) on the case with ½" spacing, where shown on **Drawings 2** and **2a**, cut thirteen ½×10" spacers from ¾"-thick scrap.

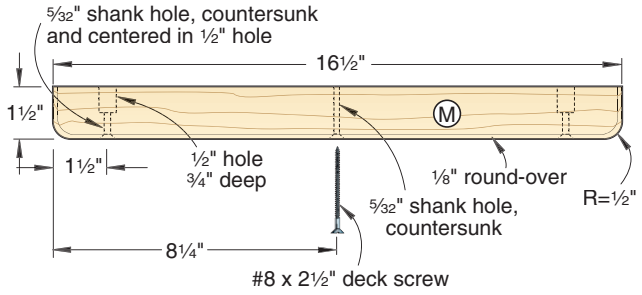
5 Lay the case on your workbench with the back (A) up. Position 12 slats (H) on the back with the spacers, as shown in **Photo C**. Make sure the bottom beveled ends of the slats mate with the beveled top edge of the bottom back rail (D) and the slats with the tree cutouts are in the locations shown on **Drawing 2**.

If you find the end slats/spacers slightly loose, shim them with card stock or business cards, as shown. If slightly tight, trim a small, equal amount of material from the end slats. Secure the slats with #8×1¼" deck screws, as shown, and remove the spacers. Repeat to install the slats (H) on the front (A) and the four slats (I) on each side (B).

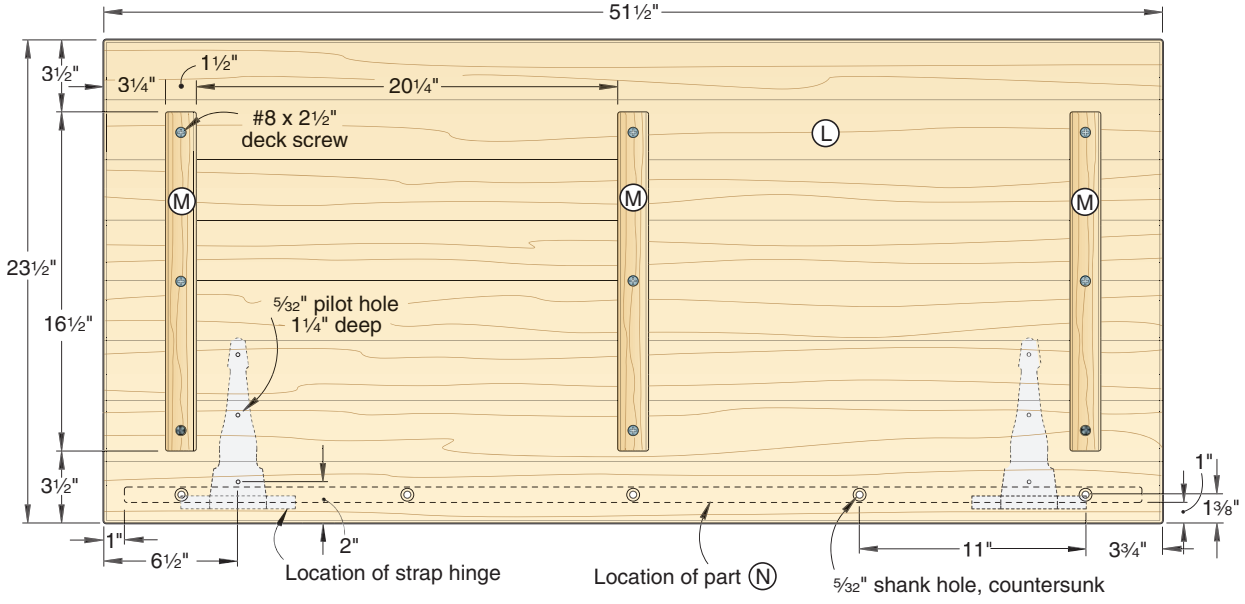
6 Clamp the top front/back rails (F) and top side rails (G) in place, flush with the top of the case. Secure them with #8×1½" deck screws.

7 Position and clamp the bottom cleats (K) in the case, where shown on **Drawing 2**, flush with the bottom. Using the shank holes in the cleats as guides, drill 3⁄32" pilot holes ½" deep into the case front/back (A). Fasten the cleats with #8×2" deck screws. Now position the bottom slats (J) in the case with the ½" spacers. Drive #8×1½" deck screws through the slats and into the cleats, and remove the spacers. Touch up the screwheads on the inside of the case with the stain.

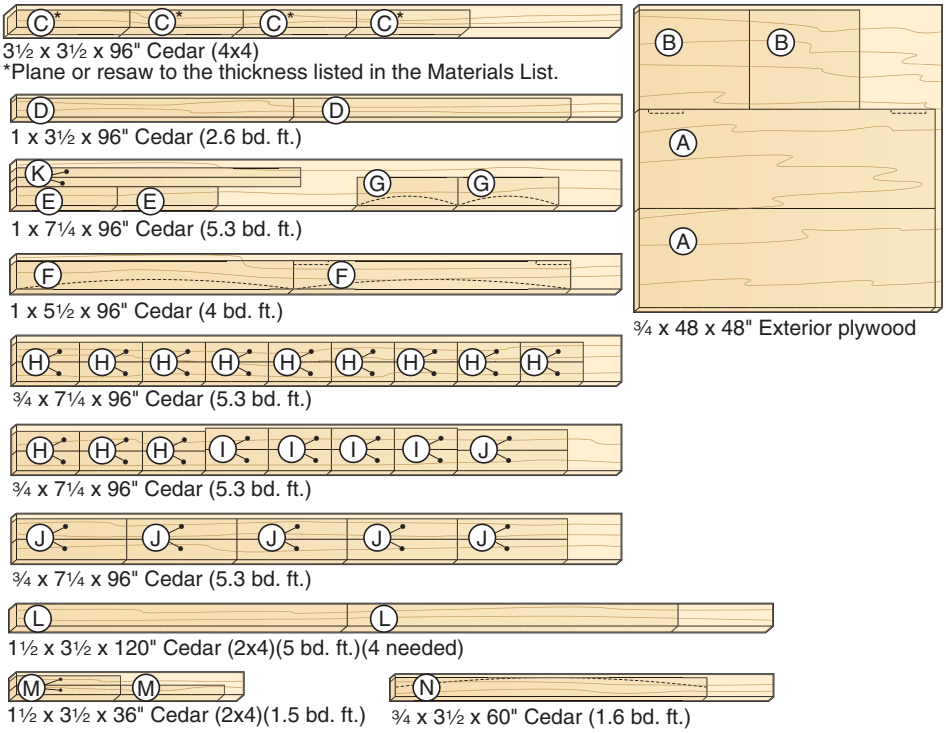
5 LID CLEAT



6 LID ASSEMBLY (Bottom face shown)



Cutting Diagram


C* C* C* C*
3½ x 3½ x 96" Cedar (4x4)
*Plane or resaw to the thickness listed in the Materials List.
D D
1 x 3½ x 96" Cedar (2.6 bd. ft.)
K E E G G
1 x 7¼ x 96" Cedar (5.3 bd. ft.)
F F
1 x 5½ x 96" Cedar (4 bd. ft.)
H H H H H H H H H
¾ x 7¼ x 96" Cedar (5.3 bd. ft.)
H H H I I I I J
¾ x 7¼ x 96" Cedar (5.3 bd. ft.)
J J J J J
¾ x 7¼ x 96" Cedar (5.3 bd. ft.)
L L
1½ x 3½ x 120" Cedar (2x4)(5 bd. ft.)(4 needed)
M M
1½ x 3½ x 36" Cedar (2x4)(1.5 bd. ft.)
N
¾ x 3½ x 60" Cedar (1.6 bd. ft.)
B B A A
¾ x 48 x 48" Exterior plywood

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Materials List

Case		FINISHED SIZE T	W	L	Matl.	Qty.
A	front/back	¾"	15¾"	47"	EP	2
B	sides	¾"	15¾"	17½"	EP	2
C*	legs	2¾"	2¾"	17"	C	4
D	bottom front/back rails	1"	3"	44"	C	2
E	bottom side rails	1"	3"	16"	C	2
F	top front/back rails	1"	4½"	44"	C	2
G	top side rails	1"	4½"	16"	C	2
H	front/back slats	¾"	3⅛"	10"	C	24
I	side slats	¾"	3⅜"	10"	C	8
J	bottom slats	¾"	3¼"	17½"	C	12
K	bottom cleats	1"	1½"	45½"	C	2
Lid assembly						
L*	lid	1½"	23½"	51½"	EC	1
M	lid cleats	1½"	1½"	16½"	C	3
N	back rail	¾"	3"	49½"	C	1

*Parts initially cut oversize. See the instructions.
Materials key: EP–exterior plywood, C–cedar, EC–edge-joined cedar.
Supplies: #8x1¼", #8x1½", #8x2", and #8x2½" deck screws; spray adhesive; polyurethane glue; 5½" strap hinges (1 pr.) with screws; #14x1¼" panhead screws (6); ⅝" screw eyes (4); #12 steel jack chain, 17" long (2).
Bit: ⅛" round-over router bit.

Sources

Plans. To purchase the paper plans for the matching pieces, call 888/636-4478, and ask for the settee, WP-OFS-1075; planter, MD-00265; chair and footrest, MD-00197; or glider, MD-00305. Or, to purchase downloadable plans for any of the items except the settee, go to woodmagazine.com/outdoor. Prices range from $8.95 to $13.95 for the paper plans and $5.95 to $8.95 for downloadable plans.

Build the lid

1 Using polyurethane glue, edge-join 1½"-thick cedar to form a 24½x52½" workpiece for the lid (L). (We used 2x4s and jointed the edges to remove the round corners.) After the glue dries, crosscut and rip the lid to the finished size of 23½x51½". Sand the faces smooth. Then rout ⅛" round-overs along all edges and corners, where shown on **Drawing 2**.

2 From 1½"-thick cedar, cut the lid cleats (M) to size. Drill ½" holes ¾" deep in the lid-side edges of the cleats at the ends, where dimensioned on **Drawing 5**. (The holes allow for movement of the lid with seasonal changes.) Next, drill 5⁄32" shank holes centered in the ½" holes through the cleats. Now drill a 5⁄32" shank hole through the center of the cleats, where shown. Turn the cleats over, and countersink all of the holes.

3 Mark ½" radii on the ends of the cleats, where shown. Bandsaw and sand to the marked lines.

4 From ¾"-thick cedar, cut the back rail (N) to size. Lay out the arch, where dimensioned on **Drawing 2**. Bandsaw and sand the arch to shape. Then rout ⅛" round-overs on the back rail and lid cleats (M), where shown on **Drawings 2** and **5**.

5 To mount the back rail (N) to the lid (L), drill 5⁄32" countersunk shank holes through the bottom of the lid along the back edge, where dimensioned on **Drawing 6**. Then clamp the rail to the top of the lid 1" in from the back edge and ends. Using the shank holes in the lid as guides, drill 3⁄32" pilot holes 1" deep into the rail, where shown on **Drawing 2**. Unclamp the rail. Now mark the left end of the rail on the bottom to ensure correct alignment later.

6 Finish-sand the lid (L), cleats (M), and back rail (N), and remove the dust. Then apply two coats of sealant, as before. When dry, position the cleats on the lid, where dimensioned on **Drawing 6**, and attach them with #8x2½" deck screws.

Mount the lid to wrap it up

1 Clamp 5½" strap hinges in the notches in the case back/top back rail (A/F), as shown in **Photo D**. Drill 5⁄32" pilot holes 1½" deep, centered in the hinge mounting holes, into the rail. Drive the #14x1½" panhead screws supplied with the hinges.

2 To mount the lid, position the case on your workbench with the front up and raised with 1¾"-tall scrap spacers under the legs (C), as shown in **Photo E**. Mark centerpoints on the *bottom* face of the lid 2" from the back edge and 6½" from the ends, where dimensioned on **Drawing 6**, for the rear mounting holes in the hinges. Position the lid, as shown. Then drill 5⁄32" pilot holes 1¼" deep, centered in the hinge mounting holes, into the lid. Now drive #14x1¼" panhead screws (not the 1½"-long screws supplied with the hinges) to fasten the lid. Touch up the screwheads with black paint to match the hinges.

3 Set the bench upright. Using a helper to hold the lid open, realign the back rail (N) on the lid, and drive the #8x2½" deck screws.

4 Finally, to install chains for holding the lid open, drill pilot holes for ⅝" screw eyes in the outer lid cleats (M) and case sides (B), where dimensioned on **Drawing 2**. Install the eyes. Using needle-nose pliers, open the eyes, slip the ends of 17" lengths of #12 steel jack chain onto them, and close the eyes. Now round up some outdoor items, place them in the bench for safekeeping, close the lid, and sit a spell to enjoy your handiwork. ¿

Written by **Owen Duvall** with **Chuck Hedlund**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine**

dowels with a difference

Miller stepped dowels feature the handcrafted look of conventional dowels with several unconventional advantages.

Whether you show them off or blend them into your project, Miller dowels reinforce joints with the strength of a standard dowel but the installation ease of a screw.

Inventor Mike Miller was spurred to look for safer alternatives to metal fasteners when a protruding nail on a boat dock punctured his hand. While recuperating, he hit on the idea of a wooden fastener that could never pull out: a stepped dowel with a head like a wooden plug and ribs for added holding power. Because stepped dowels need a stepped hole, Miller developed bits to drill holes with three to four increasingly smaller diameters. Each of the sections beneath the plug end of the dowel are drilled slightly longer than their corresponding length on the dowels, so seating the plug end on the first shoulder makes subsequent hammer blows push together the two pieces of wood.

Unlike a smooth, straight dowel, the stepped dowel's shape doesn't allow glue to trap air at the bottom of holes, as you can see by the cutaway at *right*. The plug ends are long enough to be cut and sanded flush with the face of a board, allowing the dowel to serve as both a fastener and decorative plug. Jobs where Miller dowels excel include:

- Joints that require careful or repeated test assembly prior to glue-up. Minus glue, Miller dowels can be repeatedly test fit without damaging the joint.
- Projects using MDF. Unlike screws, Miller dowels bond with the materials they're holding together instead of weakening them as would the threads of a screw or the point of a nail in MDF.
- Jigs. If there's any chance a fastener may be damaged by a saw blade or router bit, a wood dowel makes more sense than a screw or nail.

Steps formed by the drill bit are slightly longer than the ribbed steps on the dowel.

- Projects for children where you don't want the risk of plugs falling out to become a choking hazard, or metal fasteners accidentally becoming exposed.
- Reinforcing stressed joints, such as a mortise-and-tenon connection on a workbench or chair, as shown *below*. It also reinforces dadoes or rabbet joints on shelves. Unlike pin dowels, Miller dowels can be inserted and removed to test fit the joint before final assembly.

Miller dowels reinforce a mortise-and-tenon joint, and secure the edge trim on this table.

Miller Dowel Sizes and Applications

Dowel Type (shown actual size)	Dowel Length	Plug Diam.	Cost for Dowel Kit*	Cost Per Dowel*	For Stock This Thick
2X	3½"	½"	$24	$.25–.45	1⅝"
1X	2¾"	13/32"	$22	$.20–.35	¾"
Mini-X	1⅝"	¼"	$22	$.14–.25	½"

* Average prices given. Actual prices vary with vendor, quantity, and wood species of dowel.

Using Miller dowels

Butt joints reinforced with Miller dowels require a different assembly technique than that of conventional dowels. Holes in both pieces are drilled at the same time when making a Miller dowel joint. The pieces need to be perfectly aligned and held firmly in place. For this butt joint, we held the two pieces together using metal clamp-on squares, shown in **Step 1** at *right*. If the pieces aren't clamped solidly together, downward pressure on the drill bit can push the lower board away from the top one.

Because you'll trim the end of the dowel flush with the face of the wood, you don't need the precision of a drill press to make the dowel holes, as shown in **Step 2**. Some joints can be strengthened by inserting dowels at a slight diagonal that helps butted pieces resist pulling apart, although this leaves an oval plug shape on the surface.

With the holes drilled, apply glue to the ribbed portions of the dowel, as shown in **Step 3**, and tap the dowel into the pilot hole until the shoulder of the plug end seats firmly.

After the glue dries, use a flush-cutting saw to trim the plug end flush with the wood face, as shown in **Step 4**. Then sand the plug flush with the wood's surface.

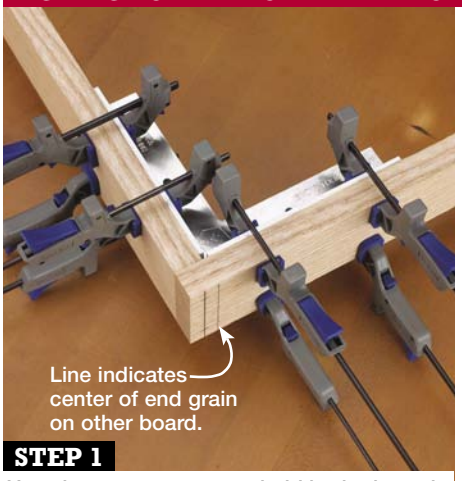
Sources

Miller dowel kits and extra dowels are available from many retail and mail-order sources, including the following:

- Lee Valley Tools, 800/871-8158 or leevalley.com
- Eagle America, 800/872-2511 or eagle-america.com
- Rockler Woodworking and Hardware, 800/279-4441 or rockler.com

Four 3D Squares are $49.95 (plus shipping and handling) from Jevons Tool Co., P.O. Box 3405, Kansas City, KS 66103; 913/384-0023 or www.jevonstoolco.com.

4 STEPS TO PERFECT MILLER DOWEL JOINTS



Use clamp-on squares to hold both pieces in position for drilling dowel pilot holes.

Use the stepped bit for a 1X Miller dowel to bore pilot holes in both pieces at once.

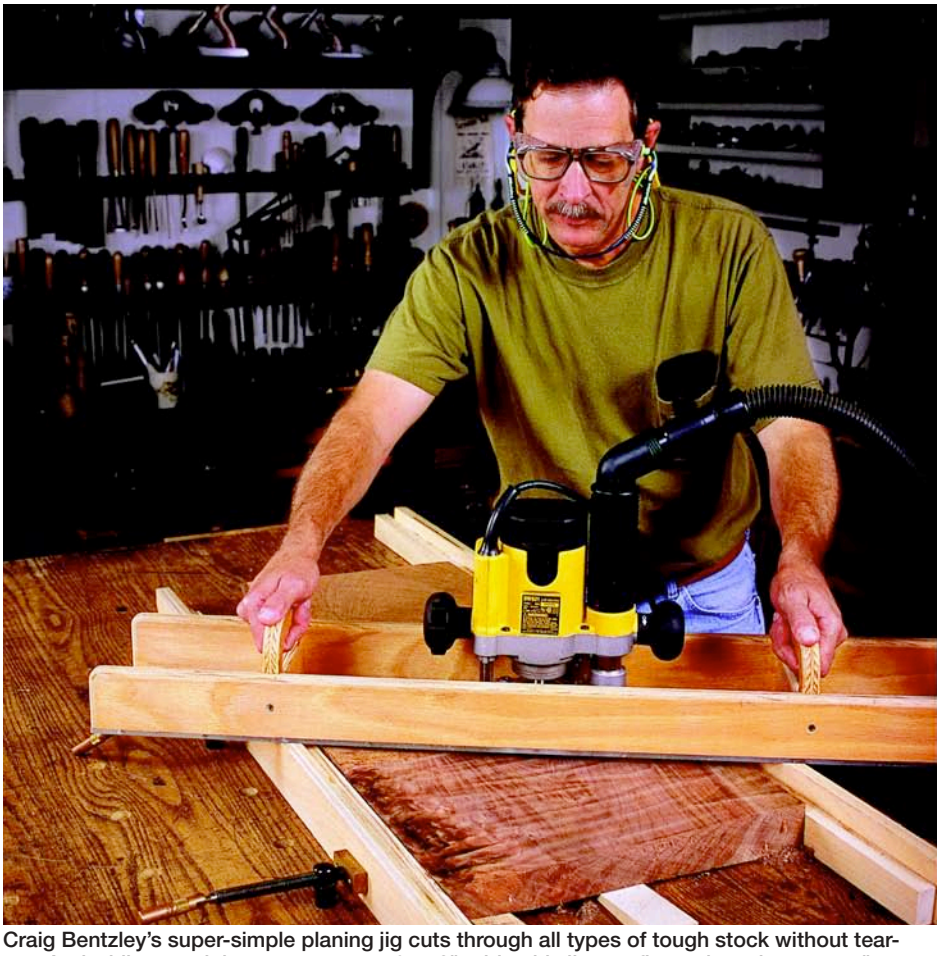
Apply glue only to the ribbed sections of the Miller dowel before insertion.

Remove exposed portions of the dowel cap with a flush-cutting saw, and sand smooth.

5 workshop projects from 3 Shop-Smart Pros

Every time we visit the shop of a well-seasoned woodworker, we come away with fresh ideas for solving common workshop challenges. These ideas typically take the form of special jigs, storage projects, and problem-solving tips. That was clearly the case when we recently caught up with the following three craftsmen.

How Craig Bentzley corrals wild grain



Craig Bentzley's super-simple planing jig cuts through all types of tough stock without tear-out. And while most jointers max out at 6 or 8"-wide, this jig can flatten boards up to 17".

"If you want gorgeous grain, you have to be willing to wrestle with some wild wood," says craftsman Craig Bentzley of Chalfont, Pennsylvania. After more than 30 years of building furniture and restoring antiques, Craig's amassed a pile of curly, crotch, quilted, and spalted stock. Like gems in the rough, these boards are destined to become door panels, tabletops, or other eye-catching parts in his museum-quality work. "Figured stock is tricky," he says. "Most production shops will toss these boards because they're too much work." Though it takes time, taming wild stock can be rewarding. "Once you see what you're working with, you won't mind the extra time," he says.

Tame tear-out with a router planing jig

Typically, wild-grained boards are cupped, twisted, or bowed. To flatten them, Craig prefers using hand planes, but this piece of crotch walnut *above*, tapered from one end to the other, required a different tact. "I could have hand-planed one face in less time than it took to build the jig. But now that it's built, the router works twice as fast." he says. The jig's rails can be sized to surface boards or laminations several feet wide or long.

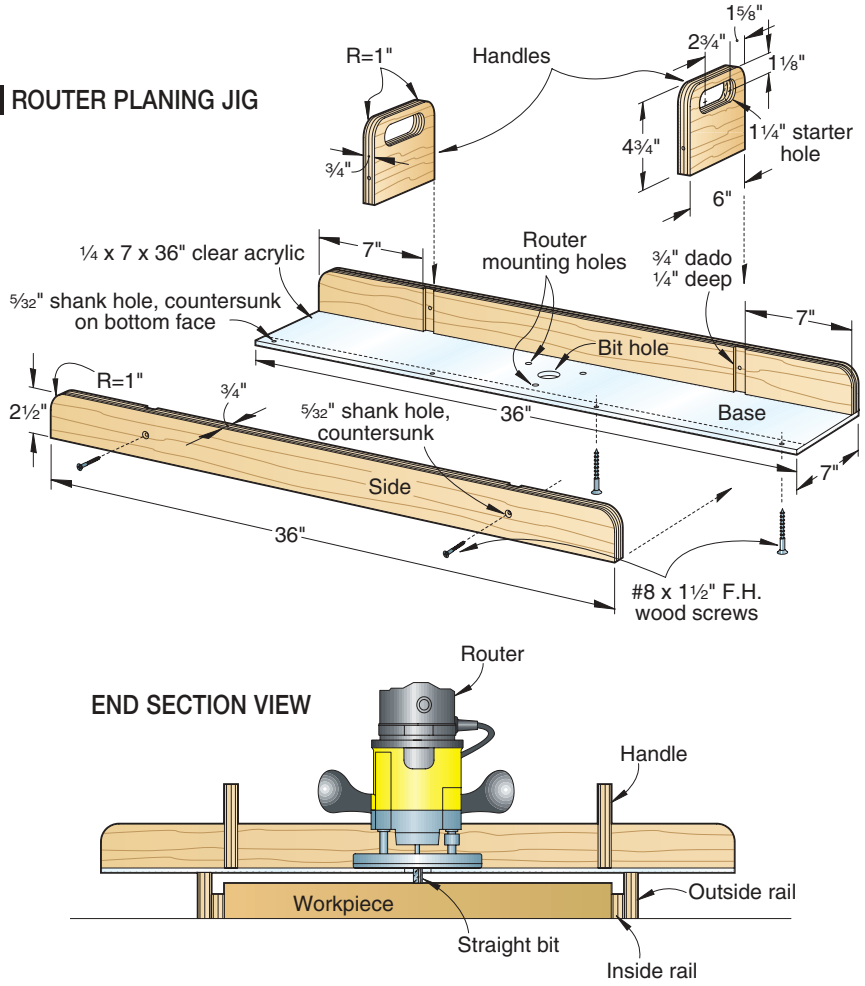
There are seven parts to Craig's jig—two sides, two handles, a base (see **Drawing 1**), and two rails. To build it, cut the parts to the dimensions shown, and then drill and countersink the screw holes in the ¼"-thick acrylic base so that the screw heads won't hit the rails and there's enough thread to attach your router. Drill and countersink the remaining screw holes for attaching the base to the sides and the sides to the handles. Bore the centered hole for router bit clearance, and the starter holes for the handle openings. Cut the handle openings, dado the sides where shown, and then glue and screw the jig together.

Note that the rails are simply made from ¾" scrap plywood. Cut them so they stand about ¼" taller and at least 6" longer than your workpiece. (The extra length prevents your router from taking a nosedive at the end of the cut. Also, the inside rail or spacer allows you to rout beyond the edge of the workpiece.) You can use any flat-bottomed bit, but a 1¼" diameter dish-carving bit (see **Sources** on *page 95*) routs a wide path. The bit's radiused edges also help transition into the next pass.

How to put the router-planing jig to work

Craig begins the planing process by first securing the workpiece to his bench and and attaching his router to the jig's acrylic base. To hold the workpiece in place and to prevent it from rocking, he uses a combination of wedges, hot-melt glue (to temporarily weld the rails to the workpiece), and bench dogs (to secure everything to the bench). Next, he sets his router bit to make a light cut, and with the tool turned on, he runs the jig over the face of the workpiece, as shown *top left*. The bit will cut the same regardless of the way the grain is running, so you can make your

1 ROUTER PLANING JIG



passes back and forth or across the board. He makes successively deeper passes, if needed, to flatten the workpiece.

This jig also doubles as a no-tear-out thicknesser. Once Craig surfaces one face, he removes the wedges, flips the board over, and surfaces the other side. Because the bit cuts the wood at a different angle than planer knives, it won't tear the stock. Leave the board about 1⁄16" extra thick for sanding router tracks.

4 Tips for Wild Wood

- Learn to read rough wood. Unusual tear-out from the sawmill might suggest bird's-eye or curly figure.
- Tame the twist first. Flatten one face using a plane, jointer, or a planing jig. At this point, minor tear-out is OK because you're only trying to establish a flat reference surface.
- Adjust your machines to cut lightly. Set your jointer and planer to make super-light cuts, especially on the first pass. To improve the cut, feed the board at an angle. You can try misting down the board with a 50/50 mixture of fabric softener and water—a mixture that helps expand and soften fibers so that they cut rather than tear out.
- When all else fails, scrape or sand. A scraper plane like the one shown *below* is faster than sanding, and leaves a smoother surface.

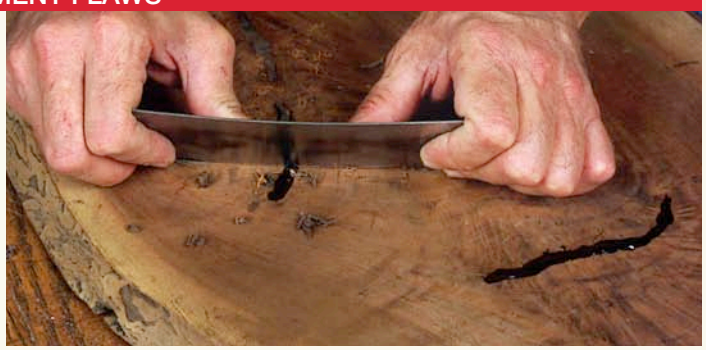
Fitting in somewhere between a smoothing plane and a belt sander, a scraping plane does the best job of cleaning up curly stock. Being the easiest plane to master, it requires no set-up and leaves a smoother finished surface than a router.

Craig's quick fix for cracks and splits

Different drying rates and unpredictable wood movement often cause highly figured boards to develop minor cracks or checks, something Craig learned how to conquer. He developed a fast way to hide minor imperfections with a small squirt of five-minute epoxy and powdered pigments (see Sources) typically used for mixing stains, *see below*. "When in doubt, use a darker shade. The eye is more easily drawn to lighter colors," he says. Craig also advises waiting until the epoxy has completely cured before scraping away any excess. If it's too rubbery, it may pull out of the crack and require redoing.

USING EPOXY AND PIGMENTS TO PLUG WOOD MOVEMENT FLAWS

Mix epoxy with a powdered pigment that's a shade or two darker than the surrounding wood. Craig overfills the crack slightly using a painter's spatula.



Use a card scraper or chisel to slice off the extra epoxy. The patch won't accept stain, but can be used under an oil, shellac, or polyurethane finish without any problems.

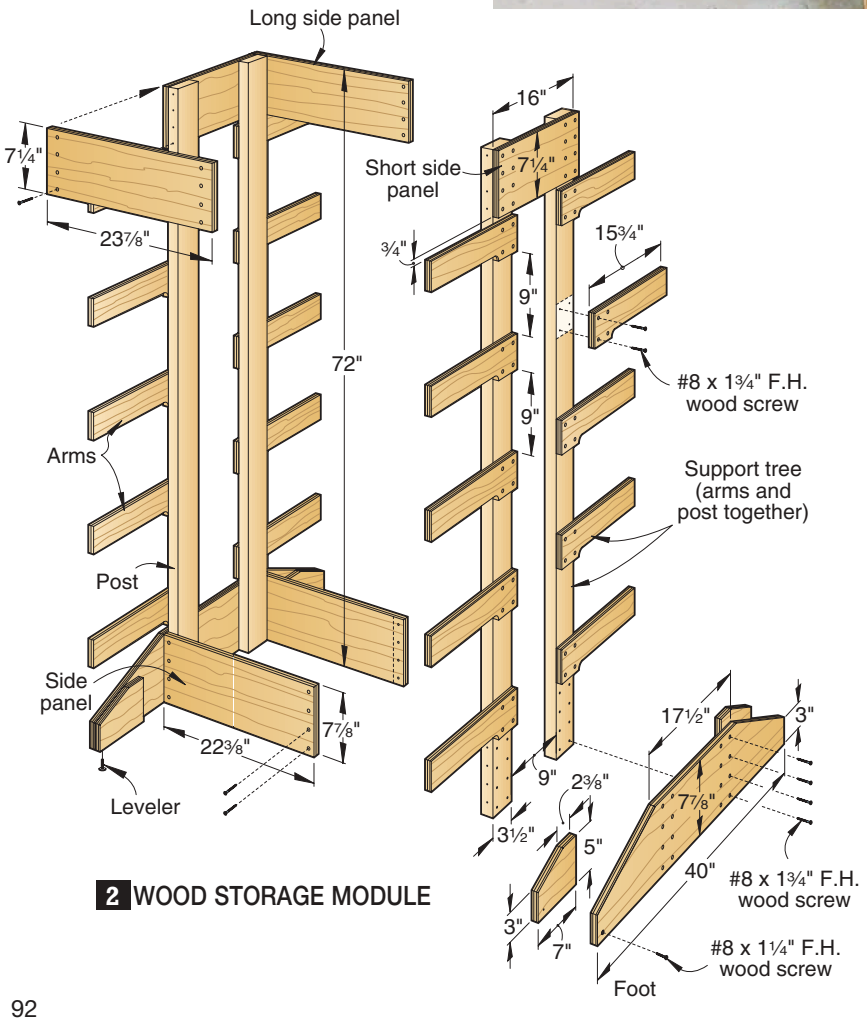
Paul Anthony tackles big boards and panel goods

You might think that a woodworker who is also a book author and a teacher would need three full-sized shops, but Paul Anthony's shop is just a converted one-car garage in Rigelsville, Pennsylvania. "With space at a premium, organization and efficiency are key," he says. With that, Paul designed a modular rack and outfeed/assembly table to keep things running smoothly.

A modular rack for loads of lumber and plywood

"The system keeps heavy lifting to a minimum," says Paul. "The wood travels in a straight line from the truck to the rack to the tablesaw." His rack consists of two 6'-tall modules connected only by the boards and sheet goods supported by the structures. (See the plans for one module in **Drawing 2.**) Spaced 2' apart, they easily can handle 8'-long panels and 10'-long boards, as shown at *right*. "The freestanding design can be placed anywhere, plus it allows you to stack wood on both sides. Smaller stacks translate into less shuffling when you want that bottom board."

Paul's easy-to-make rack keeps boards and panels out of the way, but always at arm's reach. When not in use, disassemble and stack it out of the way.



2 WOOD STORAGE MODULE

Constructing the rack

Note that each storage module consists of two support trees connected by four long side panels. (See **Drawing 2**, *left*.) Paul makes the posts from poplar, but you can substitute kiln-dried 2×4s. Be sure to use ¾" plywood for the arms for maximum strength. After rough-cutting the arms, jigsaw or bandsaw them to shape. To build one similar to Paul's, apply the arm pattern in the *WOOD Patterns®* insert, and then cut to shape.

With the parts cut, assemble the modules. Position the posts side by side and use a framing square to lay out the arm spacing. Now assemble these support trees. Glue and screw the arms to the posts to ensure they don't sag under load. After building the support trees, attach the side panels and feet with screws. To allow future disassembly, don't glue the side panels to the posts. If your floor isn't flat, you can level the base with shims, or add levelers to the foot blocks. Finally, locate a pair of storage modules and load them up.

Auxiliary table for big-time cutting support

Paul relies on this handy table to help him rip long boards, as shown *near right*. He also uses it to rough-cut large sheets of plywood, *far right*. To cut sheet goods, Paul pulls the table away from his saw, attaches a cutting guide to the panel and makes the first cut with his circular saw. Next, he removes the waste, slides the panel over to the tablesaw, and trims it to size. When not used for cutting, the table serves as a surface for project assembly.

How to make the sturdy auxiliary outfeed table

To construct Paul's auxiliary table, first measure the height of your tablesaw and use that as a guide to determine the total height of the table that includes the melamine top, legs, and lag screws. (See **Drawing 3**.) You'll want to keep the table's height just below the saw table so you can adjust up to it with the lag screws. Paul attached the aprons to the 2×2" legs using mortise-and-tenon joinery (see **Drawing 3a**) to combat the stress encountered when the table is dragged around the shop to fill different needs.

A MULTIPURPOSE OUTFEED TABLE FOR SAWING

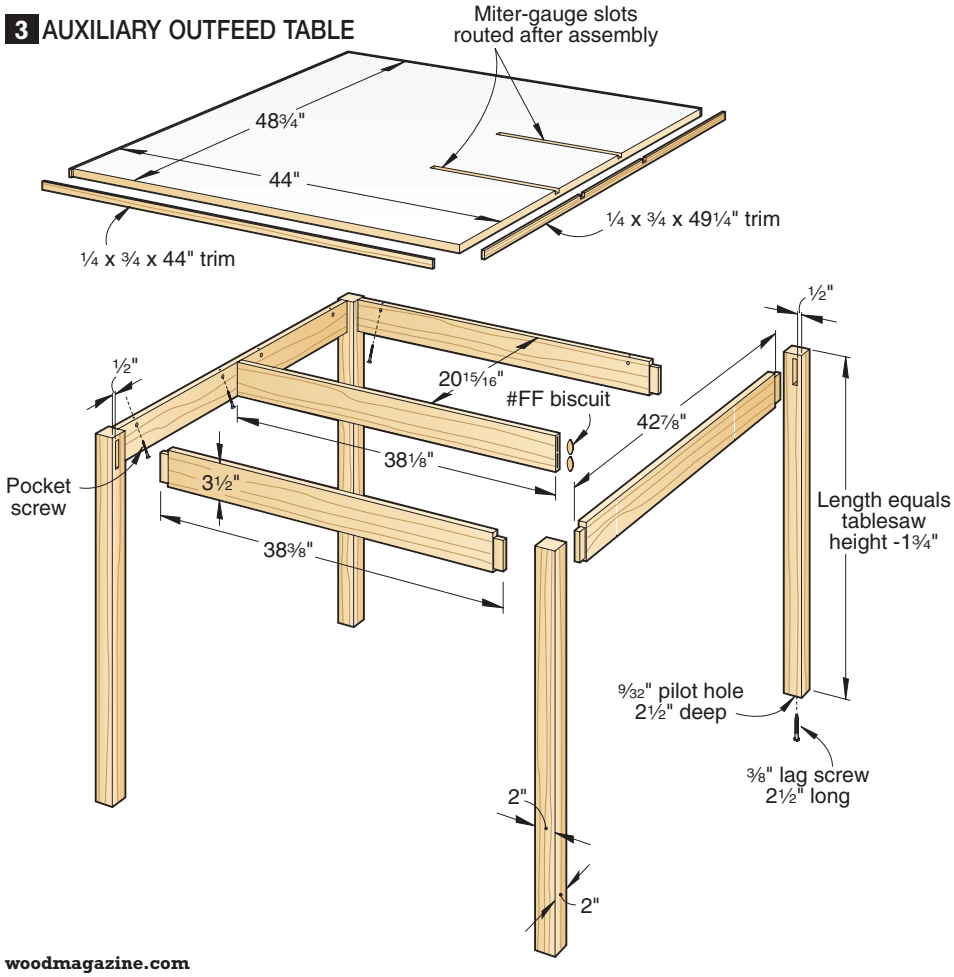
Having a big outfeed table at the far end of your saw is the best way to keep control over long boards or sheet goods during the cut.

Pulling the table away from the saw transforms Paul's outfeed table into a plywood crosscutting station.

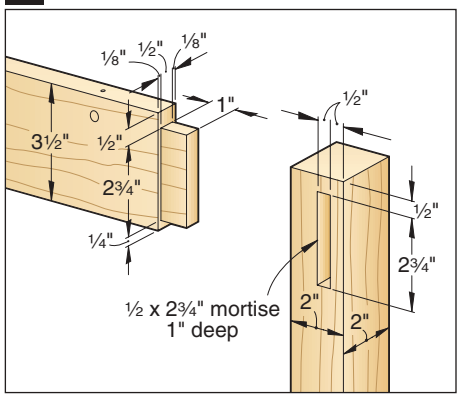
After cutting the parts to size, mill the tenons on the tablesaw. Cut the mortises with your mortiser or drill press. Alternately, you also can use Ken Burton's jig, on *page 95*, but you'll need to temporarily remove the outriggers. Test-fit the aprons and legs, and then measure the center rail to fit and cut the biscuit slots, where shown. Next, drill the pocket screw holes for attaching the top. After cutting and drilling the parts, glue and clamp the aprons to the legs.

To make the top, cut the ¾" melamine-coated particleboard to size, and then cut and attach the edging with glue. Screw the top to the rails; then flip the table over and insert the lag-screw levelers. Adjust the table height so that it's about 1/16" below the height of your saw. Finally, mark the location of your saw's miter gauge slots onto the tabletop and rout these grooves so that the top doesn't interfere with the travel of your miter gauge or any jigs that use these slots.

3 AUXILIARY OUTFEED TABLE



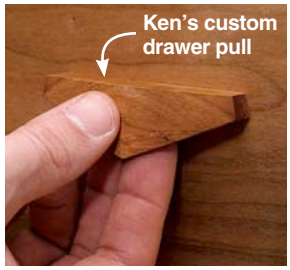
3a MORTISE-AND-TENON DETAIL



Ken Burton's safe approach for cutting small stock

A professional woodworker for 20 years, Ken Burton operates Windy Ridge Woodworks in New Tripoli, Pennsylvania. There he designs and builds studio furniture and custom cabinetry, and teaches woodworking workshops. He also authored the book *Cutting-Edge Table Saw Tips & Tricks*.

Like all of us, Ken appreciates the value of having all 10 digits. "Cutting small parts shouldn't require close calls," he says. "The key is listening to that little voice, and staying clear of the danger zone. In general, I try to keep my fingers at least 3" away from the bit or blade. But you can design simple jigs to give two or three times more clearance. Scrap plywood is a lot cheaper than a trip to the emergency room."



Craftsman Ken Burton saves times milling mortises using his customized scrapwood jig. The long base allows him to clamp the jig firmly to the workbench.

Small-part saw sled

Ken designed a six-step jig to make the three mirror-image cuts for the custom drawer pull, shown *above right*. Even if you're not building this exact piece, you can use a similar setup and process to make your next small-cut assignment safer and more accurate.

Ken made the sled from scrap plywood and pine. Using his tablesaw, he cut about halfway through the plywood. Then, without adjusting the fence, he rotated the plywood and made two more cuts. The kerf lines serve as references for positioning the pine scraps, on which he mounts toggle clamps or through which he drives screws to hold workpieces.

Sawing with the sled

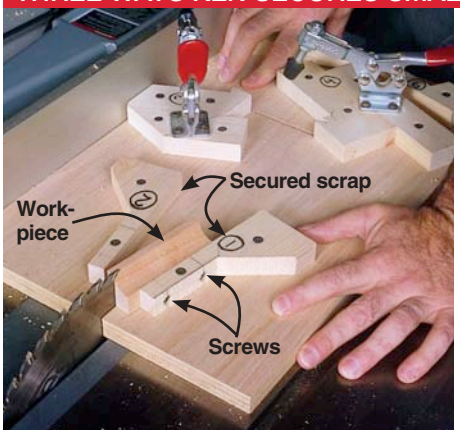
Ken employs three methods of securing small stock while safely cutting it on a tablesaw to the desired shape.

Screw clamps. This simple method consists of fastening the workpiece to a stop with drywall screws, as shown *below left*. Ken advises driving the screws into a part of the workpiece that will be concealed during assembly, or into a waste area that later will be cut away. Also, avoid locating screws where they could hit the saw blade. Turn off the saw after cutting the workpiece, staying within the sled's established kerf cuts.

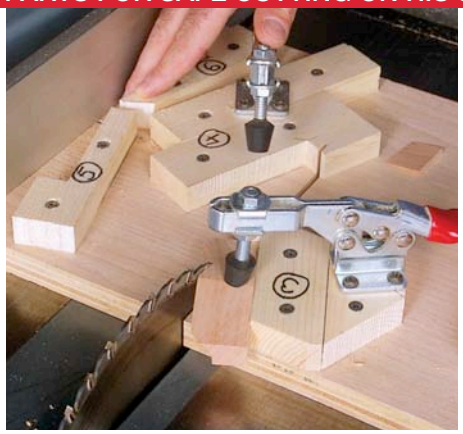
Toggle clamps. As shown *below middle*, this approach requires screwing one or more toggle clamps to the sled to provide unwavering support. The blade again will move through the established kerf cut but no farther. Ken owns a few sets of clamps and switches them to wherever he needs them.

Finger clamps. In some instances, as seen *below right*, Ken feels that it's safe enough to hold the workpiece in place with his fingers. Note that the stops provide backing for the workpiece. This method prevents the workpiece from twisting into the blade while reducing tear-out on the back side.

THREE WAYS KEN SECURES SMALL PARTS FOR SAFE CUTTING ON HIS SAW SLED

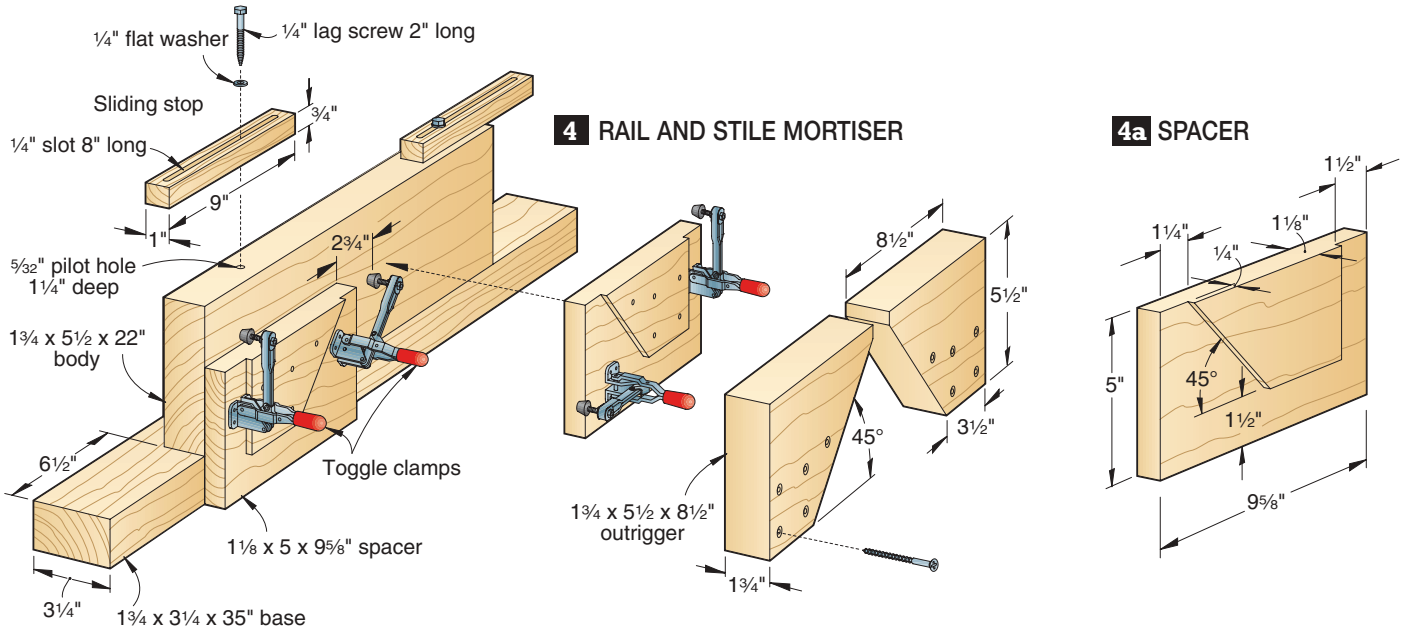


For safe sawing, Ken secures workpieces with screws to strategically placed scrap.



Ken also relies on toggle clamps that firmly hold the workpiece in place for cutting.

Kept at a safe distance, fingers and a scrap backer work well to secure a part for sawing.



Ken's Rail-and-Stile Mortiser for Loose-Tenon Joints

Routing mortises into thin stock with a plunge router can be a real balancing act, unless you have a means of safely holding the wood and supporting your router. Ken's mortising jig does just that. He attached four toggle clamps to the jig so he can use it to mortise the edges or ends of a board for loose-tenon construction. Alternately, you can rout mortises on the stiles and cut tenons on the ends of the rails. Unlike similar jigs, Ken's mortiser has "outriggers" to prevent the router from tipping into the stock at the end of the cut and damaging it. "The extra piece of wood protects your stock and the jig," he says. "I added the outriggers when I saw how the routing chewed up my first jig by the end of a cabinetmaking class I was teaching."

Construction tips for making the mortiser

To build the mortising jig, use whatever stock you have on hand. If you don't have 1¾" hardwood, go with 2× construction lumber that you run through your planer and laminate together. Cut the body and base in **Drawing 4** to size, and then center the body between the base ends and attach it to the base along one edge with screws and glue. Next, make the sliding stops. You can stop-rout a slot in a ¾×1×9" piece to make the sliding stops, or just rip three ¼" strips and glue in ¾"-long spacers between two 9"-long outside ¼" strips at each end.

To make the spacers, start with a 1½× 5×20" board. Using your tablesaw, fence, dado cutter, and miter gauge, cut the rabbets in **Drawing 4a**. Note that the drawing shows one of two mirrored spacers. Now, slice apart the two spacers from the 20" board. Cut the outriggers to size and shape. Then, complete the jig by drilling the holes for the hardware, and attach the toggle clamps, where shown.

Putting Ken's mortiser to work

First, clamp the mortiser's base to your bench. To set the jig, mark a mortise on a practice rail or stile and insert it into the jig. Position your plunge router on top and adjust the tool's edge guide and sliding stops so the bit will run directly above the location of your mortise. Make the mortise by plunging a straight bit into one end of the mortise location to full depth, raise the bit, then plunge the opposite end of the mortise. Now, rout the waste between the holes in ⅛"-deep passes until you reach full depth.

Adjust your stops to rout the opposing piece. Routing a mortise that's perfectly centered can be tricky. To ensure that opposing mortises match up (even if your measurements are a little off) mark the "good" face of your rails and stiles, and always orient that face against the back of the jig.

Sources

Router Bit: 1¼" dish-carving bit no. 91144, $27.99. Call Rockler, 800/279-4441; rockler.com.
Powdered Pigments: J.E. Moser's Fresco Colors. Woodworker's Supply, Inc. at 800/645-9292; woodworker.com

Written by: **Joe Hurst-Wajszczuk**
Photography: **Paul Anthony**

ROUTING MORTISES WITH KEN'S EDGE GUIDE

After positioning your router's edge guide and the stops on the jig, rout the mortise in the edge of the rail. To rout really thin rails, insert a piece of scrap into the jig to raise your stock.

Rout the stiles after you've done the rails. Note that the end of the board doesn't offer much wood to support your router. The jig's outriggers prevent tipping the router and bit into your work.

make dings disappear

Furniture that gets used invariably suffers accidental dents and gouges. Here's how to effectively hide them.

Professional furniture finishers and restorers know how to make their repairs disappear within the grain and color of surrounding wood. Equipped with basic knowledge about wood tones, the techniques presented here, and a little practice, you can master this skill, too.

Start by restoring a flat surface using a wood patch. Any solid filler material that bonds with the wood and flexes as it shrinks and swells will work. Patches can be made from ingredients as simple as sawdust mixed with wood glue or as sophisticated as wax burn-in sticks used by professionals.

Common store-bought wood fillers include acrylic-based products that clean up with water prior to drying; gypsum-based products often sold in powder form, giving them a long shelf life; and nitrocellulose-based putties that cure quickly. All three will perform well for general woodworking repairs using the cover-up techniques explained here.

Whichever type you choose, don't assume that "stainable" equals matching. These patching compounds will likely absorb more or less stain than the surrounding wood, as shown in the photo at *right*.

The patch-hiding technique we use here works on both new wood and finished projects. This cover-up technique uses earth-tone pigments to conceal patched areas. An assortment of 11 earth-tone powders (item #53Z04.21, $18.95) from Lee Valley Tools (800/871-8158 or leevalley.com) includes every color you'll need except white. You can find white pigment at art supply stores, which sometime sell earth-tone colors as fresco powders.

Professional refinisher Alan Noel uses pigments from the Furniture Doctor in Augusta, Georgia (800/715-2380). Owner Walter Smith offers a touch-up kit with seven 1-ounce jars of white, black, and earth-tone pigment powders plus a graining pen and five touch-up sticks, all for about $63 with shipping.

You'll also need a fine-tip sable brush; a piece of glass roughly 6" square or larger; dewaxed blond shellac mixed to a 1-pound cut or thinner; denatured alcohol for use as a shellac thinner and brush cleaner; sandpaper in 220 and 320 grits; a putty knife; crafts knife; and painters' masking tape.

KEYS TO A CONVINCING COVER-UP

The porous texture of some wood putties makes them soak up more stain than the surrounding wood.

To avoid excess stain both in and around the patch, cover the putty with a light coat of shellac before attempting a color match.

A graining pen helps you reproduce grain lines that mimic wood. A fine-bristle brush and dark pigments produce a similar look.

Pigment samples sealed in place with clear shipping tape make it easier to estimate the colors needed to match surrounding wood.

Filling and flattening

Filling gouges, especially deep ones, leads to a common problem: dips and bumps in your patch. Just when you think everything's even, the drying process leaves a dip in the center of the patch that has to be filled. Solve this problem when patching unfinished wood by surrounding the patch area with two layers of painter's tape, as shown at *right*. That creates a shallow buildup on the surface while preventing putty from filling the pores of the surrounding wood.

After the putty dries, remove the tape to leave a small raised area ready to be sanded with a flat sanding block. Patches may be softer than surrounding wood, so avoid soft or pliable sanding pads that might leave a depression. Patching finished pieces is trickier because you need to avoid damaging the surrounding finish. Instead of masking tape, use one layer of transparent shipping tape with the damaged area cut out. Fill and partially sand the patch with the tape still attached. Then remove the tape, and finish sanding using 400-grit paper on a sanding block that's as wide as your patch.

Making a patch match

This is a skill best developed by practicing on scrapwood. If your patching material is stainable, consider sealing the patch surface with thinned shellac to avoid over-darkening the patch. Then stain your wood to the desired color and apply a sealer coat to the whole surface to lock in the finish.

A dry pigment color chart similar to the one shown *opposite bottom right* gives you an approximate sense of a pigment's color, but the actual color will change after adding shellac and applying it to the wood surface. Always match colors under natural or incandescent light for the greatest accuracy.

TWO WAYS TO PATCH WOOD RIGHT THE FIRST TIME

Press putty into the damaged area enclosed by two layers of masking tape, which also keeps excess putty off surrounding wood.

Colored putty sticks can be rubbed into minor dings for a quick fix. Some types can be blended to create custom colors.

For easy matching, mix colors atop a piece of glass resting on the wood near the patch.

Some pigments provide a close color match by themselves. Burnt sienna approximates cherry, for example, and burnt umber comes close to mahogany. Match red or white oak by tinting yellow ocher with white pigment and adding burnt umber as needed to mimic red oak.

Using the tip of a crafts knife and your glass palette, add small amounts of pigments you'll need to achieve the right color. (See "Color Is a Balancing Act," *below right*.) Then add drops of shellac to the glass and gradually mix in pigments. If the shellac dries before you can complete your layer, rejuvenate it with a couple drops of denatured alcohol. Shellac dries quickly but allows you to remove even dried layers using a rag moistened with denatured alcohol. Don't oversaturate your patch with alcohol; it may loosen or decay.

If the shellac still dries before you complete the match, substitute natural (clear) liquid stain as a carrier for a longer drying time. You can switch to shellac after gaining more experience. Let the natural stain dry; then seal each layer before adding the next.

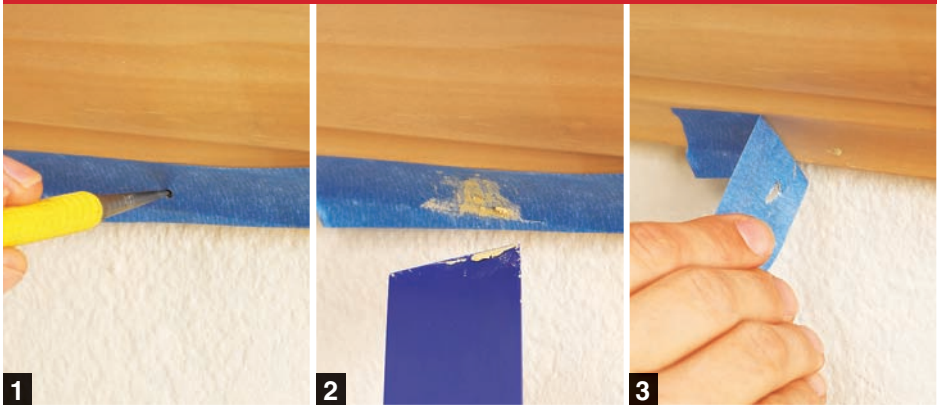
Start by applying a background color—the lightest shade you see in the wood. Brush with the wood grain slightly past the rim of the patch to more effectively blend your repairs with the surrounding wood, especially if any stain applied prior to color matching left a ring around the patch. Allow that layer to dry thoroughly, and seal it with your topcoat or a spray finish, if necessary.

On the subsequent layers, add slightly darker tones to gradually build your way up to the color of the surrounding wood If you're using the natural stain, seal the changes after each layer.

Then add grain lines to help tie the patch into the surrounding wood, as shown *opposite lower left*. Space the lines to copy adjoining grain and cross the edges of the patch. Do this before your last overall finish coat to help blend these marks into earlier layers and surrounding wood.

You're finished when the patch meets Alan's "6-foot rule": If the patch blends in from 6 feet away, it's a match.

MAKE FAST AND SUBTLE PATCHES IN CROWN MOLDING



1. Apply a piece of painter's tape where you'll drive your nail and countersink a finishing nail beneath the wood surface. **2.** Patch as you normally would. **3.** After the patch dries, pull the tape away to leave an easy-to-sand patch and no smears on the surrounding wood.

COLOR IS A BALANCING ACT

Brown is a mix of red and green. That's why wood tones lean toward either a red or green hue you'll need to match. Adding raw umber pigment, for example, lends a greenish brown tint to patch colors, while burnt sienna adds a reddish brown. Mixing yellow ocher or raw sienna will lighten a blend while introducing more yellow. Add white or black as needed to lighten or darken pigments.

carving a niche

Elaborate details transform one woodworker's projects into extraordinary pieces of art.

Byron Brayton set up shop in Manchester, Connecticut, not long after emigrating from his native Poland 18 years ago. To establish his business and pay the bills, he took on all kinds of jobs, including remodeling, furnituremaking, and refurbishing antiques.

Always fascinated with antiques, he wasn't a fan of refinishing them, but enjoyed working on those that required him to carve new pieces to replace damaged ones. He found he had a knack for carving, and gained skills as he worked. During this time, he also began using veneers.

Today Byron spends most of his time crafting elegant furniture and built-ins distinguished by gorgeous veneer and incredible carvings. The cradle he crafted from mahogany and quilted maple stands as a testament to his skills

All photographs: Richard Bergen

A few tools, talent, and a lot of time are what it takes for Byron to create the details that make his furniture stand out.

Byron creates his carvings by first sketching and then refining his ideas on paper. Next, he traces the finalized drawing onto the wood using carbon paper.

After that, he duplicates the sketch using ordinary carving tools available from any woodworking retailer. Sharp tools and slow, methodical work, he says, are critical for creating intricate details.

Byron also advises that you select wood carefully, especially when learning to carve. He likes working with mahogany because of its even grain—it doesn't misguide tools or tear out easily. Basswood and walnut represent other good choices for wood-workers wanting to learn the craft.

Finally, Byron says, you can distinguish your work by moving beyond straight lines and flat surfaces. "Woodworkers often feel restricted to squares and straight lines because that's what machines will produce easily. But adding curves and hand-hewn details doesn't have to be difficult, and can set your pieces apart from others," he says. The details on his chess table, *right*, bear this out.

To create this ornate cradle, Byron laminated thin plywood to form the tub, added ends, and covered it with veneer. The base and applied carvings are crafted from solid wood.

Graceful cabriole legs and carved moldings applied to the straight-edged stretchers add distinctive shape to this mahogany chess table. Ebony and holly veneer make up the checkerboard.

shop-proven products

These woodworking wares passed our shop trials.

Spiral jointer adds a new twist to surfacing wood

If you've ever surfaced highly figured wood with a jointer or planer, you know the result: inevitable tear-out because the tool's knives can't help but catch *somewhere* on the every-which-way grain. Professional woodworking shops often turn to spiral cutterhead jointers and planers because the curvy knives shear the wood, rather than chop it. Grizzly brings this spiral-cutting action home with its G0526 jointer.

However, instead of having rows of spiral-shaped knives, the G0526 uses 34 square, solid carbide self-indexing cutters arranged in four spiral-shape slots that wrap around the cutterhead. Each staggered row of cutters removes the material left by the gap between the cutters in the row before it. All four edges of each cutter are sharpened, so if you nick one, you simply pull it out, rotate it 90°, and quickly return to the business of jointing.

Technically, the G0526 doesn't duplicate the shearing action of a true spiral jointer, but I face-jointed hard maple, red oak, curly maple, and some unruly walnut (complete with knots and wild grain), and the surfaces came out supersmooth with no tear-out. Each piece needed only light sanding before applying finish.

Next, I removed all of the cutters, dropped them in a bag to mix them up, and reinstalled them in random order. I then jointed the wild walnut and curly maple again, and was rewarded with the same silky-smooth surface. (Replacement cutters cost $20 for a set of 10.)

Two other attributes make this jointer a strong contender for your shop: The 60" total bed length extends about a foot longer than most 6" jointers and works great with long stock. And the stalk-mounted magnetic power switch is easier to reach than a cabinet-mounted switch.

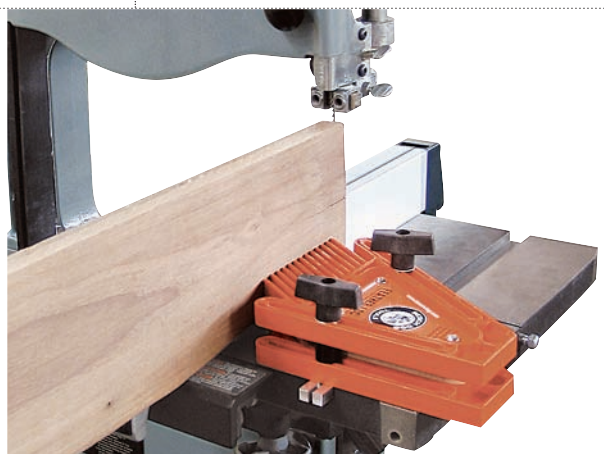
—Tested by Pat Lowry

Grizzly G0526 6" Jointer with Spiral Cutterhead

Performance	★★★★★
Price	$975

Grizzly Industrial
800/523-4777; grizzly.com
800/786-8902, benchdog.com

Tandem feather boards stack up for tall work



I love feather boards. They keep a workpiece flat on a router table or tablesaw, or press that same workpiece tight against the fence to ensure a consistent cut. I've used Feather-Loc feather boards on my router table for some time now, so I was happy to test out the latest addition to the Bench Dog line: the Tandem Feather-Loc.

Basically, the Tandem is two single Feather-Locs stacked together with an MDF spacer between. That makes the whole assembly nearly 2" thick and provides good support for vertical operations, such as routing a raised panel with a vertical panel-raising bit in your router table.

I made such a panel in 4/4 red oak, and the Tandem Feather-Loc helped me get a clean, chatter-free cut. However, I saw little advantage while ripping ¾"-thick stock on my tablesaw. (It held well, but no better than a single Feather-Loc.) However, moving to the bandsaw for some resawing action, the Tandem Feather-Loc worked well, keeping the pressure higher up and applying consistent force to the board even after I adjusted the fence for blade drift.

One thing I like about the Feather-Locs is the idiot-proof method for locating the feather board. The first "tooth" is slightly shorter than the rest of them; simply nudge this up to the workpiece, lock the feather board down, and the remaining teeth provide just-right pressure.

—Tested by Pat Lowry

Tandem Feather-Loc

Performance	★★★★☆
Price	$36

Bench Dog
800/786-8902, benchdog.com

Continued on page 106

Roller supports lend a hand almost anywhere

Although my wife happily supports my woodworking, she's not always happy to support wood when I'm working. Seems I'm always calling her into the shop to lend a hand with an oversize workpiece on the jointer, planer, or mitersaw. So she was pleased to see me testing Rockler's Roller Support with Universal Clamp.

This 17"-wide roller installs on nearly anything from 1" to 2½" thick: a benchtop, sawhorse, you name it. (I have an assembly table with an overhanging ¾"-thick plywood top, and I had to shim the roller's clamp.) The pivoting clamp grabs onto a horizontal or vertical surface, or at any angle in between—although the only situation I could imagine this being useful is to compensate for an unlevel floor.

If you need to move the support side-to-side, it shifts along the roller's axis 3½" either way. At its lowest position, the roller supports stock 3" above the benchtop, making it a good choice for most mitersaws and some portable planers; it maxes out at about 15¼" of height. And, when you're done for the day, the Roller Support easily hangs on the wall.

—Tested by Jeff Hall

Roller Support with Universal Clamp (64194)

Performance	★★★★★
Price	**one support, $38; two or more supports, $34 ea.**

Rockler Woodworking and Hardware
800/279-4441; rockler.com

About our product tests

We test hundreds of tools and accessories, but only those that earn at least three stars for performance make the final cut and appear in this section. Our testers this issue include: high-school industrial arts and woodworking teacher **Jeff Hall**, and *WOOD*® magazine techniques editor **Pat Lowry**.

what's ahead

A sneak peek at what you'll find in the June/July issue (on sale May 17)

Classic projects and more

FEATURED PROJECT

Sliding-door, stackable cabinet

Two identical cabinets make up this handsome piece. Depending on your needs, you also could build just one and top it off to make a sideboard. You'll marvel at the simple-to-install, smooth-running, and affordable sliding-door hardware.

Bathroom cabinet and shelf

Why buy ho-hum medicine cabinets and shelves when you can build ones that look so much nicer?

Paper towel holder

Set it on a counter-top or hang it below a cabinet; then use this quick-and-easy project for storage and mess cleanup.

Outdoor trellis and privacy screen

This simple structure adds elegance to any landscape, and can serve as an attractive buffer between you and neighbors.

Tools, shop enhancements, finishing, and techniques

TOOL TEST

$500–$700 tablesaws

Looking for a mid-priced saw that's sturdy and accurate? Don't miss this review of eleven models.

8 ways to upgrade a workbench

Turn your plain-Jane bench into a workshop workhorse with one or more of the simple improvements presented here.

Pro advice on country finishes

Craftsman Curtis Buchanan makes first-rate Windsor chairs. Learn how he gives them an equally top-notch finish.

Keeping panels flat

Discover how to assemble and glue flat panels and how to install them so they stay that way...forever!

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